INDIA—THE LAND AND THE PEOPLE

Geography of Jammu and Kashmir

GEOGRAPHY
OF
JAMMU AND KASHMIR

A. N. RAINA

NATIONAL BOOK TRUST, INDIA, NEW DELHI

First Edition 1971 (Saka 1893)
Second Revised Edition 1977 (Saka 1899)
Third Revised Edition 1981 (Saka 1902)

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Rs. 17.00

Published by the Director, National Book Trust, India
A-5, Green Park, New Delhi-110016 and Printed at
The Central Electric Press, 80-D, Kamla Nagar, Delhi-110007

To the memory of

Jawaharlal Nehru

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Jawaharlal Nehru

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FOREWORD

This is the third edition of "Geography of Jammu and Kashmir" that the National Book Trust, India has brought out. The revised edition has been brought uptodate to the close of the 5th Five Year Plan.

Being son of the soil the author, Dr. A.N. Raina, who combines in himself the rare qualities of an academic as well as a research scholar and a geographer of repute, gives intimate glimpses of the land of his birth based on his personal experience and thorough knowledge of the land, its people and their culture and history. Happily you will find that unlike writers who have written about Kashmir in the past treating the people as a part of the landscape, Dr. Raina has been at pains to explain that besides the bounties of nature with which the valley is endowed, there are also people with throbbing hearts and pulsating with life.

S.M. ABDULLAH
Chief Minister
Jammu and Kashmir

Srinagar,
15 May 1980

PREFACE TO THE THIRD EDITION

THE THIRD edition of "Geography of Jammu and Kashmir" brings it to the close of the Fifth Five Year Plan. Care has been taken to include the latest statistical information available about the socio-economic developments within the physical campus of the diverse features forming the State. It is expected to serve the reader whose criticism for guidance in future will be gratefully accepted.

The chapter on vegetation and forests has been kindly revised and corrected by Dr. M.L. Dhar.

My school teacher, Mr. S.M. Abdullah whose FOREWORD is self explanatory deserves my gratitude.

A.N. RAINA

PREFACE TO THE SECOND EDITION

TWO BOOKS on Kashmir were desired to be written by our beloved leader Pandit Jawaharlal Nehru. One was a scientific geography of the entire State of Jammu and Kashmir and the other a history on cultural synthesis in this Himalayan land about which he wrote thus:

"For hundreds of years it (Kashmir) was politically a part of India long before the British came. Culturally of course, it has been one of the biggest seats of Indian culture and learning throughout history for about 2,000 years. Some of the finest books on Indian history were written in Kashmir."

The Geography of Jammu and Kashmir was prepared in a very short time only to be placed before Panditji whose state of health was precarious. The first edition, therefore, was based on field notes and what little statistical data could be available. Even then the book could not be ready in time.

In a mood of guarded optimism, therefore, the second edition has been revised and enlarged to justify a detailed geographical introduction to the study of the State of Jammu and Kashmir. As a border state of strategic importance—references had to be made to a wide range of other developing disciplines for a study of physical, economic and cultural problems. Human settlement on regional basis has been given due importance with reliable data for proper analysis of facts.

It may not be possible to thank all those who helped me to complete this work but mention may be made of Dr. M.L. Dhar. Vice-Chancellor, Banaras Hindu University who gave me suggestions in writing the chapters on vegetation, forest products and their utilization. Dr. S. Kaul, formerly Director Health Services, Jammu and Kashmir was kind enough to go through some of the proofs. Dr. M.P. Thakore, Principal Bhagat Singh College, New Delhi gave me valuable assistance. Sri J.N. Zutshi, Director, Census Operations, Jammu and Kashmir deserves my gratitude.

A.N. Raina

PREFACE TO THE FIRST EDITION

I wish to express my gratitude to Shri Sheo Narayan Fotedar, Chairman, Legislative Council, Jammu and Kashmir State, but for whose constant encouragement and interest this book might never have been written. Professor S.P. Chatterjee, Director, National Atlas Organisation, Calcutta deserves my thanks for making valuable suggestions and criticisms thereby helping me place this book in a proper perspective in regard to field study. My thanks are also due to a number of friends and particularly to Shri Dwarka Nath Razdan, Deputy Director (Information), J & K State, for generous help, Shri Muninder Nath Raina, Engineer, National Coal Development Corporation, Korba (M.P.), for assisting me in the selection of cartographic material used in this book and to all those writers whose field notes proved very helpful to me in bringing the information presented up-to-date, as far as possible.

A.N. Raina

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INTRODUCTION

Who has not heared of the Vale of Kashmir,
With its roses the brightest that earth ever gave,
Its temples and grottos and fountains clear,
As the love-lighted eyes that hang over their wave.

Moore

PHYSICAL SETTING

The relief features of the state of Jammu and Kashmīr have been compared to a three storeyed house. The Outer Plain bordering the province of Jammu with its undulating compound and the Outer Hill Region forms the first storey. The Middle Mountains of the Panjal including Bhadrwah, Kishtwar Doda and Ramban towards Banihal form the second storey. The Greater Himalayas across the valley of Kashmir overlook this region from Gilgit and Ladakh with its high peaks of Nanga Parbat (Diyamir) 8,107.68 m and the Rakaposhi. Altitude rises towards the North with K_2, the second highest mountain peak in the world at a height of 8,615.172 m above sea level on the Karakorum (Mustagh range). Chengehenmo about 4,267.2 m high lies to the south-east. In this varied physiography the river system has enabled the growth of culture and the spread of civilization through the ages.

Drew's *Jammu and Kashmir* is essentially a geophysical survey but *Ain Akbari* gives a graphic account of Kashmir and its people. The *Rajtarangini* of Kalhana Pandit is indeed, a rich source of early history of this beautiful land. Aurel Stein in his *Memoir on Ancient Geography of Kashmir* summarizes some of the regional details of the valley in early times without which it is not possible to understand and utilize historical contents of the Kashmir chronicle.

CLIMATE

A variety of climate with a sudden rise in altitude and a marked difference in prevailing winds, varying pressure and precipitation presents a complex climatic indicator. Climate influences soil, vegetation and the processes of cultivation. The south-west monsoon causes rain in the Outer Plain and the Outer Hill Region when these moisture laden winds strike the Middle Mountains causing strong rain.

A line drawn from Punch to Uri on the map and then along the southerly edge of the Pir Panjal near the 33° North Latitude may be taken as the wind divide for purposes of summer precipitation. The influence of relief features, however, shows a marked increase in summer rainfall from Ramnagar, Udhampur, Reasi, Basoli, Bhadrwah, Gulabgarh and Kishtwar. Further north precipitation is obstructed by the Middle Mountains facing the windward side of the plain of the Punjab.

Quite conspicuous is the position of the Kashmir valley within the sub-humid high altitude zone. As the altitude rises towards the meadowy slopes of the Pir Panjal, known as the *margs*, temperature decreases from 24°C at Srinagar (1,600 m) to 10°C at an elevation of 3,600 m; until the middle of June weather conditions are pleasant. It is then that heat increases and high humidity makes it oppressive till the middle of August.

The entire valley of Kashmir wears a haze hiding the surrounding monntains from view. The autumn months have bright clear days with pleasant weather. Winter is severe. The mid-Mediterranean depressions blow over the Afghan border after passing over Iran (Persia) and cause precipitation in the valley of Kashmir and its surrounding high mountains. The precipitation is in the form of snow in winter months.

Spring lasts from March to May. The hottest months are July and August. There is a marked seasonal rhythm of two months each with 92.71 mm of rainfall in March and April. July and August are also rainy with an average of 59.18 mm and 61.46 mm respectively. The Himalayan ramparts being a meteorological barrier the influence of the monsoon is weak. Out of 11.5 cm of total precipitation more than 40 per cent is received during December to March, the period of general dryness for the country as a whole. Thus, low temperature and low relative humidity impart keen atmospheric conditions to the region.

The result of pedogenic processes on rocks forming soil is a rich source of wealth for cultivation. These processes of soil development show a difference from terrigenous clay to fresh alluvium. Highly rich loam and light loam with a high percentage of sand is spread in the valley of Kashmir beyond which there is sandy clay and sandy-clay-loam mostly in Ladakh. The formation of soils in Kashmir is, therefore, the result of climatic factors and geomorphic processes aided by lithology.

MINERALS

The mineral wealth is varied with its use for arts, crafts and manufactures of the land. Field surveys for mineral exploitation have begun in coal (lignite) at Handwara (Kashmir) and Reasi (Jammu). Besides gem-stones, gypsum, clay, copper and bauxite, there is iron ore. Iron ore was mined in the early days and used for construction as seen now at Ramban in the old and unused suspension bridge across the river Chenab. The mineral resources of the region are limited and less known as the mineral-bearing horizons are highly disturbed and discontinuous due to intense folding and faulting. Alluvial gold, garnet, ruby, sapphire and semi-precious stones are found in the terraces of the Indus valley and its surrounding areas.

AGRICULTURE

Agriculture continues to be the main industry engaging 81.41 per cent of the total population in one form or the other. The net sown area is 7.06 lakh hectares out of a total area of 24.20 lakh hectares according to the village papers. It works out to 29 per cent of the total area. The area sown more than once is 1.59 lakh hectares or 22.5 per cent of the net sown area. The classification of land helps in determining use and non-use of land. Generally speaking 30 per cent area is used for non-agricultural purposes as it is uncultivable. The existing acreage of cultivation is on the increase with irrigation facilities. More than 361,374 acres have been declared as culturable waste. The new methods of suitable crop rotation to enable lands to be cultivated more than once will indeed add to the agricultural yield.

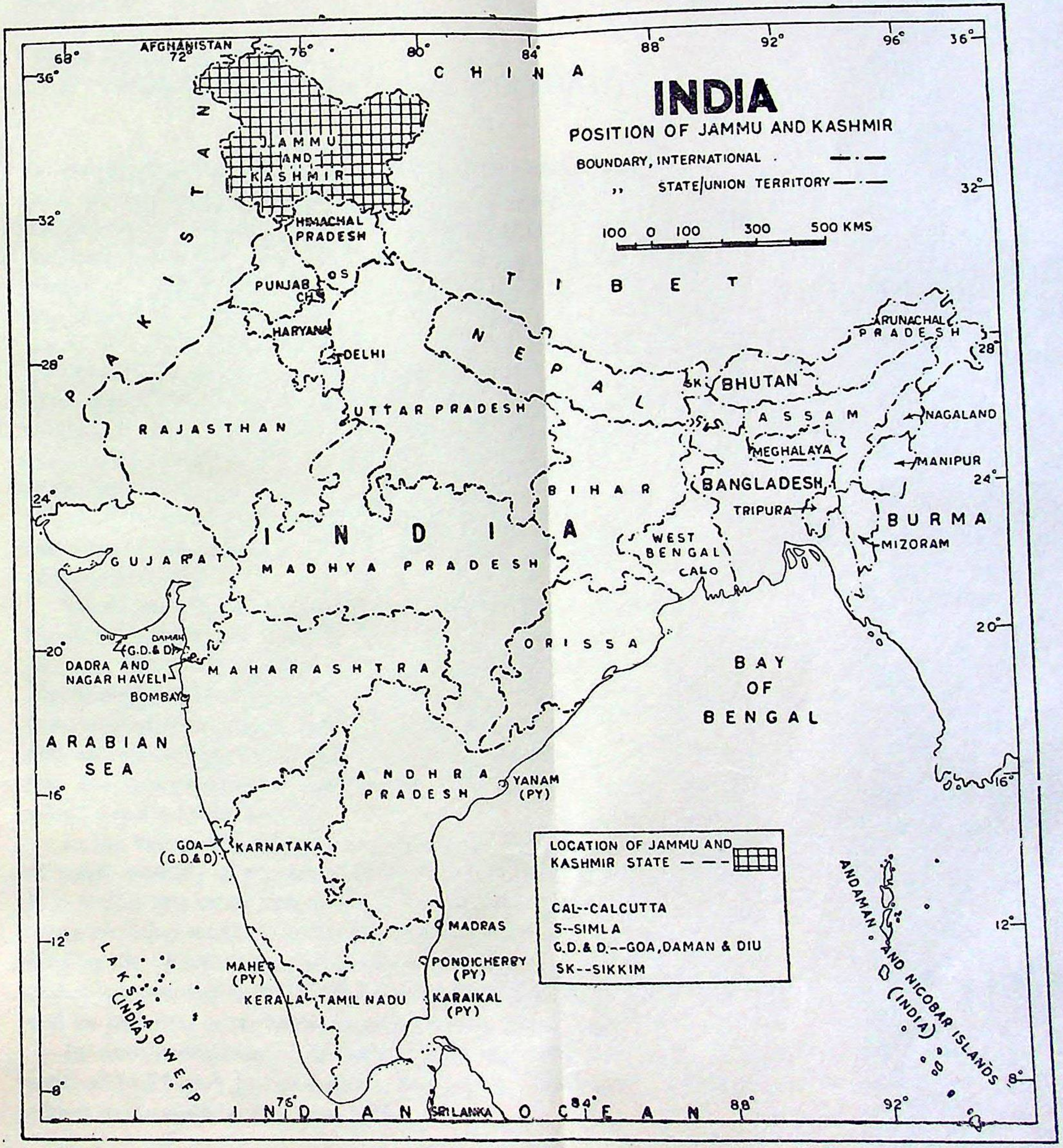
Agricultural experts have suggested a comparative study of processes of cultivation similar to those in Switzerland and Finland where geophysical conditions are more or less similar. The problem is pressing as the region is deficient in food because of low yield. Though 90 per cent of the total cropped area is under foodgrains, with the size of a farm holding at 1.5 hectares signifying a heavy pressure on arable land. The other sectors of the economy are yet to be developed to lighten the pressure on land. Efforts in the direction of use of manures, high yielding variety seeds, fertilizers and agricultural machinery are recieving more and more attention. In recent years commerial crops have been cultivated in the form of flowers, vegetable seeds and mushrooms.

Agricultural research should be a serious concern now. Compared to the rest of the Indian Union the yield is low and 70 per cent of the area in the district of Ladakh is wasteland, arid and dry.

The green valley bottom is littered with lakes, rivers and swamps. Approximately 130 km long and 30 to 40 km in width at an elevation of about 1,800 m in the valley of Kashmir has characteristic fragmentation of holdings—a definite handicap. Devices are still primitive and erection of weirs with stones and twigs restricts the widening of extent.

Field research is necessary. A beginning has been made in the study of productive potential of soil and the use of better seed. More and more field work is needed under expert guidance and an integrating organization for educating the farmer who is even now guided by the age-old adages.

Harad khalya byol chāri
sontas kus prāri
In autumn store seed
To sow in early spring.
Bedānd zirāt
suy gov khatrat
A farmers's field withot oxen
is a real danger.
Red in the night the shepherds' delight,
Red in the morning the shepherds' warning
Nun che Mum
Salt means wool.



Based upon Survey of India map with the permission of the Surveyor General of India

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The territorial waters of India extend into the sea to a distance of twelve nautical miles measured from the appropriate base line

Map 1

The boundary of Meghalaya shown on this map is as interpreted rom the North-Eastern Areas (Reorganisation) Act 1971, but has et to be verified.

Dānd Wayit--Gāo chāwit

Try a plough bullock and milk a cow before purchase.

LIVESTOCK

Livestock continues to be a source of real help to agriculture in all its operations. Cattle suit the farmers whose agricultural operations are all timed. With more than 2.2 million cattle and buffaloes in the State, only 2.52 lakh cows and 1.15 lakh buffaloes are in milk. Severe climate is responsible for low numbers of varieties in livestock and low yield of milk which is estimated at 1,80,000 tonnes annually. In recent years attention has been given to feed and fodder along with an effort to set up projects to enable intensive cattle development. The setting up of nutrition laboratories to test the quality of feed is bound to bring in some improvement. New breeds have been introduced to improve the strength and quality of livestock mostly in cattle. The per capita availability of milk is estimated at 100 grams but in the Fifth Plan the production is proposed to be raised to 2.25 lakh tonnes increasing per capita availability to 110 grams by the end of the year 1979.

Sheep breeding receives considerabe attention. The merino cross-breed has given some success. Importance of sheep for its multi-purpose use is recognised as an asset to the economy of the State. The graziers numbering about 400,000 (*gujjars* and *bakerwals*) have been restricted in their mobility now. Besides, there has been economic and social development in these once nomadic people who are settled now and enjoy benefits of education, credit facilities and other trades which need a wider market.

In the valley of Kashmir surrounded by high mountains the limit of zonal mobility of graziers extends from 3,000 to 7,000 m contour. It is within this range that grass is found on glades where melting snow provides water. Cross-breed progeny envisages increase in yield. During the Fourth Plan period the population of sheep was 11.5 lakh and it is estimated to be 12 lakh during the Fifth Plan. About 60 lakh will be the total cross-breed progeny by the end of 1979.

In wool production, 3.25 lakh kg will be added to the present yield of 14.25 lakh kg. In mutton too, about 17.67 lakh kg will be added to the yield by the year 1979.

LADAKH

Ladakh breeds livestock. Some species are peculiar to this region like yaks, *demos* and pashmina goats. These animals stand the rigours of severe winter and can be reared at very low temperature. On an average a person in Ladakh owns six heads of cattle. A cattle breeding research farm has begun its work at Murtse. At Chushul a Pashmina sheep and wool farm has been functioning since the year 1958. Leh, Kargil and Dras have been chosen as centres for development of animal husbandry.

Ladakh is no more isolated. There are now post and telegraph facilities. Leh is linked with Srinagar by wireless telephone. Leh, Kargil and Dras have many modern facilities and opening of road and regular air services from Chandigarh and Srinagar have opened the interior of this lofty mountainous area to people and trade.

COMMUNICATIONS

Transport is regarded as the life-blood of commerce, necessary for the development of internal as well as external trade. The development of transport is an index of the degree of economic development and in a mountainous area like the State of Jammu and Kashmir with its mountains, hills, plateaux and glaciers the need for communications and transport cannot be over-emphasized. There is a variety of climates ranging from parching arid plains in the south of the Siwaliks to the middle mountains of Kud, Patni-Top, Batote, Bhadrwah, Kishtwar and Banihal where summer rainfall averages about 1,142 mm. The climate presents a marked variation till the valley of Kashmir is reached.

An efficient road system would connect the interior with the main net of communications. Man is still the beast of burden in some of the mountainous areas. Yak and goat help man to carry load in Ladakh. Carts without wheels are also used. Road transport has improved significantly in spite of difficult topography. Even though it has been calculated that the intensity of roads of all descriptions was 4.6 kms per 100 sq. kms which is very low compared to an all-India average at 10 kms of surfaced roads per 100 sq. kms. New schemes are in progress and the remodelling of existing roads, reconstruction of bridges and culverts, widening of pavements to two-lane width is on. In hilly and backward parts of the State a beginning has been made to envisage a network of roads. With 80 per cent of the population living in villages rural roads need urgent attention.

The valley of Kashmir has a heavy snowfall in winter. Rain falls mainly in spring and autumn. From mid-December to April the valley receives 341.8 mm of precipitation in the form of snow. This form of precipitation is stored in mountains and is termed as "treasure", it is the source of irrigation that flows steadily when temperature rises from May onwards. In higher elevations rushing streams help transport and tributaries provide cheap transport for fuel, food and timber. The river Jhelum was the main artery of trade prior to the road, the rail and the airways. The deep-cut gorges of the river Chenab in the Middle Mountains enable heavy material to move with the current.

The Outer Plain is connected with a fairly good network of roads, the main being the Pathankot-Jammu-Srinagar Road. The opening of railway extending all over India provides train service beyond Pathankot across the river Ravi to Jammu through Kathua, Budhi, Hiranagar, Dyalchak, Samba, Vijaypur and Bari Brahman. It is now a stable link of communication for passengers and goods in this strategically vital region of the country.

The air service now in operation connects Leh (Ladakh) with Srinagar, Jammu, Amritsar, Chandigarh and Delhi. At present the time distance of weeks and days has been reduced to 40 minutes from Jammu to Srinagar (175 kms), Srinagar to Leh 90 minutes (312 kms), Delhi to Jammu 60 minutes (527 kms) and Delhi to Srinagar 90 minutes (642 kms). Air service now in operation provides useful meteorological information on high altitudes, from 304.8 m to 6,096 m above sea level. Speedy communication and also nautical telecommunication has already added to the comfort and knowledge of man with radio and television. The installation of a radio station at Leh and the opening of post offices with savings bank facilities together with telephone and telegraph communication has added to the development of this backward region.

A border state in the extreme north of the Indian Union with two powerful neighbouring countries, Russia and China, close to its frontiers deserves constant vigil. Geopolitical considerations need constant review. The unity of nations and peaceful uses of science and technology advocated emphatically by the first Prime Minister of India

Pandit Jawaharlal Nehru, continue to be the ideal of this great country. But history records three major conflicts when this State suffered the ravages of war. The Cease Fire Line warmed up again in 1965 and was later 'frozen' again after the Tashkent Agreement till it suffered a change in 1971 when the Line of Actual Control came into force. The latest effort for durable peace in the sub-continent is the Simla Agreement which again appears an attempt to bring India and Pakistan closer.

The opening of the railway from Pathankot to Jammu along with a first class Dhar Road, connecting Pathankot with Udhampur imparts strength to the depth of defence in this sensitive border state. Air service has already dominated communications and use of modern means of science and technology has reached a degree of reasonable service to people.

In the State of Jammu and Kashmir each region has its own geographical peculiarities imparting to it a geomorphic personality of its own. This needs a detailed study from the environmental and the human point of view. The study of the resource-base and use of modern methods to improve economic standards of inhabitants will, therefore, form the study of the following chapters.

Chapter I

GEOGRAPHICAL POSITION

LOCATION

The territories of Jammu, Kashmir, Ladakh and Gilgit form the State of Jammu and Kashmir. It is the nothern-most State of the Indian Union. Mostly mountainous, the area of this largest princely State before the year 1947, was 2,22,797.4194 sq.km. In the map of Asia it occupies a central position. It crowns the extreme north of the Indian Union (Map I).

From the north to the south, the Jammu and Kashmir State extends over 640 kms and 480 km from east to west. Dotted with many low-lying valleys, this irregular mountainous area lies between 32° 17′ North and 36° 58′ North Latitude and 73° 25′ East and 80° 30′ East Latitude. The standard time is 5½ hours ahead of Greenwich time as in the rest of the Indian Union. The difference in local time is half an hour. In latitude the geographical area of this State crorresponds to Peshawar (Pakistan), Baghdad and Damascus, Fez (Morocco) and the State of South Carolina (USA).

EXTENT

The Jammu and Kashmir State is bounded on the north by Chinese and Russian Turkistan, on the east by Chinese Tibet, on the south by the Punjab and on the west by the North-Western Frontier Province of Pakistan. Russia (U.S.S.R), China, Afghanistan and Pakistan come close to the boundaries of the Indian Union in this border State.

The vale of *Ab-i-Panja*, the panhandle (*wakhan*) of Afghanistan separates India from the USSR. Its strategic location elicits a deep interest in this region from the world powers.

The relief of the territories forming the Jammu and Kasmir State presents a picture of a three-storeyed house with three distinct physiographic divisions. The province of Jammu with the Siwaliks and the Outer Hills forms the first storey. The word *Siwalik* means the edge of the roof of Lord Shiva's dwelling. This word was first used by Babur, the founder of the Moghul dynasty in India. In his memoirs, this word has been used in its topographical sense. The Siwaliks are overlooked by the high Panjal mountain ranges of the Middle Himalayas which are clothed with thick vegetation. The Pir Panjal ranges of mountains is crossed now at an elevation of 2,194.56m above sea level through the Jawahar Tunnel. This tunnel leads to the north into the oval valley of Kashmir.

The valley of Kashmir, a structural basin, lies between the Pir Panjal and the *Himadri*. It is only at Baramulla, 54.4 km to the north of Srinagar, the summer capital of the State, that the river Jhelum (*Vitasta*) flows out through the mountain gorge known as *Bahramgol*, Baramulla, beyond which the river is not navigable. Originating from the eastern mountain girdle of the vale of Kashmir the river Jhelum meanders in the vale, enters the Wular Lake, leaves it near Sopore and flows in a narrow gorge across the Pir Panjal from Baramulla to Muzaffarbad, where it sharply turns towards the south making a typical hair pin bend.

Beyond the valley of Kashmir rise the Greater Himalayas (Inner Himalayas) to the north and east where Ladakh and Gilgit form the habitable areas at a very high altitude. The well-known Zanskar Range lies here and is bounded on the north by the deep gorge of the river Indus. The Ladakh Range is situated between the river Indus and the river Shyok forming the prominent river of the Trans-Himalayan region. The Karakoram range of mountains extend further the river Hunza in the north-west to the river Shyok in the east for a distance of 400 kms aptly called the "shining crest of the Earth", *vasudha ka dhawal sheersha*. It is here that the Pamir, rightly called the "roof of the world", attains prominent physiographic eminence. Beyond these patchy settlements of civilizations, the geographical frontiers of India were first defined and defended by a great soldier-statesman Maharaja Gulab Singh, the founder of the Dogra dynasty in Jammu and Kashmir.

BOUNDARIES

In the mountainous complex of the territories of Jammu, Kashmir, Ladakh and Gilgit it was difficult to demarcate absolute geographical boundaries. The migratory population of the trans-border graziers numbering over 400,000 (1941) was responsible for some sort of demarcational uncertainty. Even Maharaja Gulab Singh got the territories demarcated, extending them from the river Ravi in the east to the river Indus in the West, as laid down by the Treaty of Amritsar, 1846. The State was made compact by giving up the district of Hazara and annexing Mandhir, Dadhir, Kathua, Suchetgarh and part of Munawar. Thus river Jhelum became the boundary line from Muzaffarbad to the town of Jhelum, a distance of about 240 km. Upto the year 1947 the administration of the State extended over the whole of Gilgit (*wazarat*) district right up to Misgarh on the south of the Mintaks Pass (4,697m) above sea-level.

The invasion by Pakistan in the year 1949 altered the boundaries of the State. In the year 1948 the territories of the State were split up by the Cease Fire Line when 83,787.9 sq. km of territory was occupied by Pakistan leaving 138,992.1 sq. km. on the Indian side. The administrative divisions also suffered changes due to the shrinkage in area.

The People's Republic of China launched a massive attack in October 1962, occupying 6,474.9375 sq. km. of Indian territory in Aksai Chin in Ladakh. After the Unilateral Cease Fire, the occupied area was sliced off shrinking the longitudinal extent in the east from 80° 20′ East to 78° East Longitude towards Chushul and Demchok. The traditional boundary between India and China was altered in the Chinese maps from the year 1928 onwards. Attempts to include large areas of Indian territory as part of China differed in alignment.

The Cease-Fire Line has been the line of demarcation between the Pakistan-occupied areas of the State of Jammu and Kashmir and the Indian side of the territories. It is at Burejal near Manawar that the Line passes to the north of Deva after touching the river Manawarwali Tawi to the east of the Sadabad village in the Nowshehra *tahsil*. The Line curves towads Bisale due north to Mendhar in Punch *tahsil* across the river Punch. To the north-east the Line passes through the Bitar Nala and then due east with a slight bend to the north of Mandi village. The Line stretches due north and then to Uri with a western loop towards Urusa. It then crosses the river Jhelum west of Urusa zigzagging towards the north to the west of Mawar Jagir and then to the east of Dhani village and to the west of the river Krishenganga. To the east of this river and across the mountains of Gurez, south of Kel, and then to the north, the Line reaches Kargil.

The Cease-Fire Line is neither a frontier nor a boundary, but a line drawn to restrict the movement of armed troops in the western and northern areas of the State when the hostilities stopped on the first day of the year 1949. A study of this boundary line shows that generally relief has influenced this demarcation. There has, however, been constant violation of this line of demarcation in the armed conflicts of the years 1965 and 1971. The Line of Actual Control accepted on December 17, 1971 slightly altered the position of the Cease-Fire Line in the Bhimbar *tahsil* in Jammu Province.

Historically speaking, the Treaty of 1878 was the culmination of Dogra diplomacy when Maharaja Ranbir Singh was accepted as the overlord by the Mehtar of Chitral. The British diplomacy realized the strategic importance of the unruly tribes of Puniyal, Yasin, Nagir, Ishkoman, Kohghizar, Chilas and Hunza. These areas of strategic importance were declared as "unsettled" and taken over by the British under direct administration. The slow method of British annexation covered the entire western districts of the State from Mirpur, Kotli, Palandhri, Bagh, Muzaffarbad and Karnah. The Trans-Indus region of Gilgit was taken on lease for sixty years. The *de facto* merger of these areas within the North-West Frontier Province brought this region directly under the British. The creation of an armed force, re-arming the unruly tribals and the training to the Gilgit Scouts by the British army officers was a preparation to challenge the autority of the Maharaja of Kashmir. It resulted in the dramatic fall of Gigit in 1947.

TRIGNOMETRICAL SURVEY

A trignometrical survey of the state of Jammu and Kashmir began in 1857 when Maharaja Gulab Singh wanted demarcation on a map for regional details of frontiers. Trebeck's survey with Moorcraft (1820-1823) was an outline but Alexander Cunningham prepared boundary maps soon after the Treaty of Amritsar in 1846.

A rough map of Ladakh was first prepared by Henry Strachey. Field work was done by a veteran mountain surveyor William Johnson who also covered the deep gorges of the Sutlej, the Spiti, the Chandrabagha (the upper Chenab), Kulu, Lahaul and across the

Bara Lacha La to Kashmir. Montgomerie, who joined the Great Trignometrical survey in 1825, set out a chain of triangles across the Pir Panjal into the Kashmir valley. Shelverton surveyed north and east of Kishtwar in the Middle Himalayas. Beverley took over the triangulation of Zoji La towards Dras. Bronlow took intersections from the stations to the north of the Wular Lake and found K_2 to be 8534.4 m above sea level.

Maharaja Ranbir Singh took keen interest in trignometrical survey when 12.7 mm survey of the Kashmir valley was complete. Special attention was given to Ladakh where many points were fixed in Chang Chenmo to cover the territories of the State. To the west across the river Shyok, the river Yarkand and the Karakorum pass Godwin Austin and other plane tablers completed the survey of Ladakh as far east as the Pangong Tso and its string of lakes. The quarter inch map of Jammu and Kashmir and its adjacent countries was completed in the year 1862. It enabled the travellers, surveyors, mountaineering experts, traders and tourists to pass through Gilgit, Hunza, Nagir, Misgarh towards the Kilik pass across the Tagdambush Pamir where the three empires met. From Leh caravans moved one after the other to the river Yarkand and then to Sinkiang where India too had its hold.

Chapter II

GEOLOGY, STRUCTURE, ROCKS

The main characteristics of geology in Jammu, Kashmir, Gilgit and Ladakh were first formulated by a veteran geologist, R. Lydekkar. He was followed by Middlemiss, Hayden, Burrard, De Terra, Wadia and others. A field study of stratified rock formations resulted in a broad division of three main structural groups in the entire territories forming the State of Jammu and Kashmir—the Panjal, the Zanskar and the Tertiary Groups.

The Panjal includes the Outer Plain, the Outer Hills and the Middle Mountains. The Zanskar includes the whole of the eastern region from Spiti and Lahaul to the lofty Karakoram in the north. The Tertiary Groups include the valley of Kashmir and other river valleys. These three geological divisions correspond to the three well-known physiographic divisions of which, in many respects, these are an expression of geomorphological characteristics.

The territories of the State fall within the geological history of mountain-building movements in northern India. The powerful lateral thrusts have acted from the north or the Tibetan direction towards the south, causing folds. The proof of the force of these thrusts is seen in the steep side of the Himalayas towards the plain of the Punjab. As has already been stated, the entire area has been under a prominent system of thrusts like the Panjal and Zanskar. The outermost is the main boundary fault. The entire mountainous region with parallel and converging ranges extending over 38 km is intersected by many small valleys known as "duns" and uplands. The biggest and most elevated is the block of High Asia. Beyond it lies the Trans-Himalaya region. The Himalayas terminated to the north-west at the great bend of the river Indus where it cuts through the Kashmir Himalayas.

The Zanskar Range bifurcates from the Central Himalayan axis near Kulu. The other range is the Dhauladhar, extending further north-west as the Pir Panjal range, conspicuous and picturesque. Between these two branches of the crystalline axis of the Himalayas lies the longitudinal valley of Kashmir, 134.4 km by 40 km. The valley of Kashmir extends from south-east to north-west. The long diameter of this oval vale with a mean level of 1,850 m above the sea level is parallel to the general strike of the ranges of the Himalayas.

THE SIWALIK SYSTEM

The newer Tertiaries occur along the Outer Hills of the province of Jammu, from the river Ravi to the river Jhelum. It is known as the Siwalik system after the hills of that name near Hardwar (Uttar Pradesh), where the Ganges emerges from the mountains into the plains.

The entire character of lithology and palaentology of this system appears to be the same over a long distance of 240 km. Geologically it belongs to the plains but topographically to the hills and mountains. The entire material of the Siwaliks owes its origin to the erosive action of the mountain streams. The processes of folding are clearly seen in dips which are at some places inverted or reversed with the overturning of the fold planes to high inclined positions. The pressure of the thrusts through mountain-building processes has disrupted parts of these folds, making pre-Siwalik rocks appear over the younger rocks. As a result of these thrusts, an interesting view of the geomorphic features showing reversed faults with the Tertiary beds underneath appears in the entire region. Rapid erosion has altered its topography. The rock types found in this region are mostly coarsely bedded sandstones, sandrock, clays and conglomerates; consolidated micaceous sandstones and red spales are also found. An important feature of topography in this region is the gigantic escarpments and dip slopes separated by broad longitudinal strike valleys intersected by deep meandering ravines of the transverse streams. Rapid erosion has caused sub-aerial waste to spread since the Pleistocene.

The highest interest of the Siwalik system of deposits is biological. A rich collection of petrified remains of animals of the vertebrate sub-kingdom, the immediate ancestors of modern species of land mammalia, has been unearthed. Skulls, jaws, teeth and bones of these animals are preserved from decay being swept down in the streams descending from the mountains. The mammalia race has disappeared from these swampy Siwalik jungles. Palaeontologists have, however, collected some vestiges of mollusca, remains of several river fish, tusks (2.7448 m long preserved in the Geological Museum of the Gandhi Memorial Science College, Jammu), gigantic crocodiles, bones of tortoise, the four-horned animal Sivatherium (larger than a rhinoceros), bones of monkeys, camels, horses, elephants, giraffes, antelopes, hippopotami, reptiles and struthious birds.

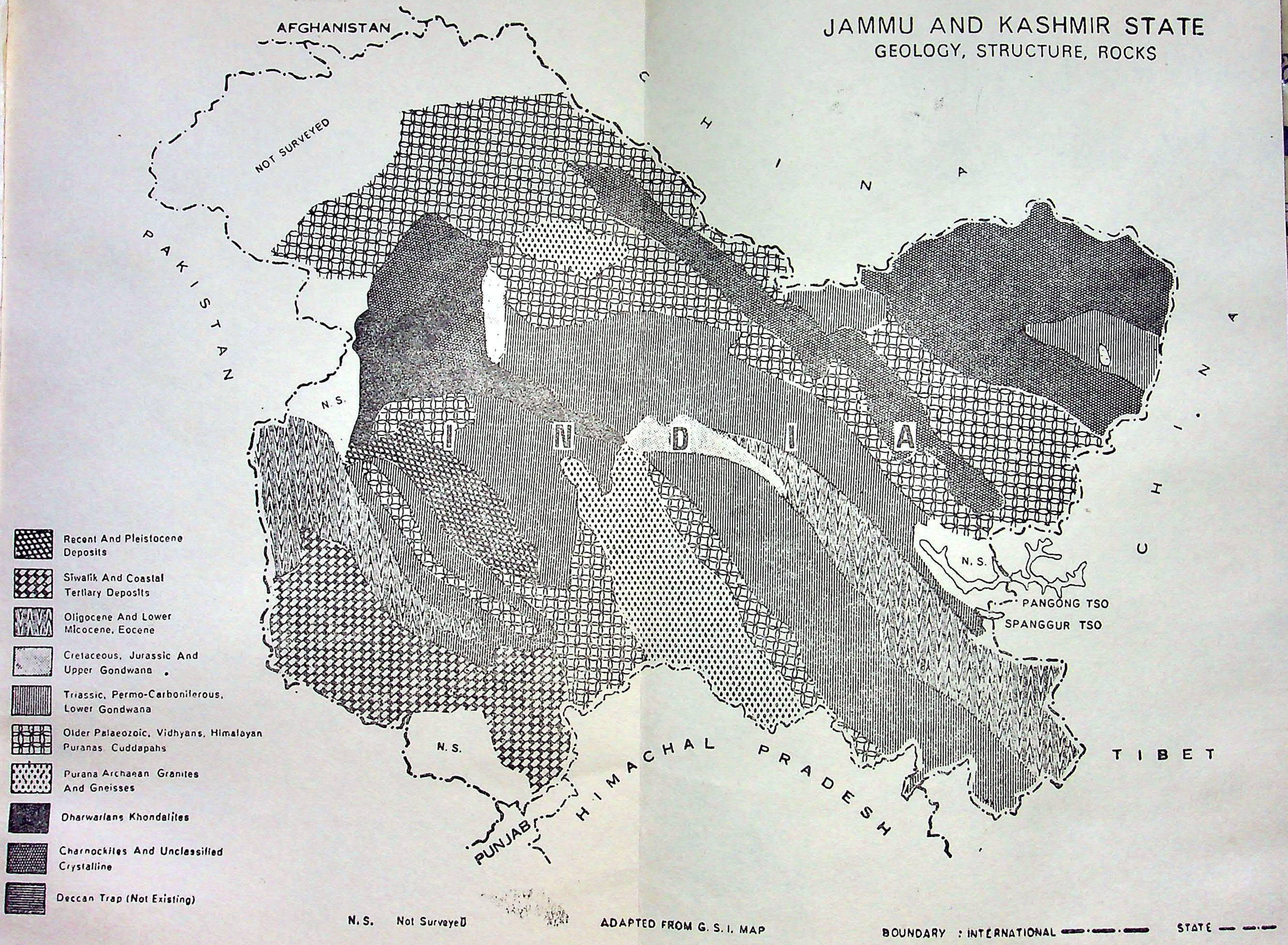
The evolution of species in the Siwalik region appears to have been rapid because of the abundance of food supply, a salubrious climate, sufficient water supply and rich vegetation.

THE ZANSKAR SYSTEM

The Zanskar includes the whole of the eastern division from Spiti and Lahaul, 32°17' North Latitude, to the lofty Karakorum mountains in the north. The axis known as the Zanskar Range bifurcates from the Central Himalayas near Kulu. This north-west extension of the Middle Ranges forms the core of the Dhauladhar, the Zanskar and the ranges beyond in Ladakh and Baltistan. Stoliezka termed these ranges as "Central Gneiss", igneous and Archaean in age. Later field studies revealed their intrusive origin. The crystalline complex is found to be of pre-Cambrian metamorphic sedimentary origin, forming the basement, on which all the subsequent geological formations rest. The Kashmir Hazara area is typically Zanskar with intrusive granites and sedimentary archaeans. There has been extreme dynamic metamorphism in this region. The rock types are mostly biotite granite, hornblende granite, tourmaline granite, biotite schists, dolorite, epidiorite gabbro and pyroxenite.

In the Zanskar range and in Gilgit, Baltistan and Ladakh, the crystalline development is very much marked.

The Kazi Nag is the trans-Jhelum continuation of this range and so is the broad area of Kishtwar in the Middle Himalayas. The Zanskar range, because of its prominent development of the crystalline core, makes it a structural continuation of the Great Himalayan chain. Beyond the Pir Panjal, the entire outcrop is that of the crystalline series widening towards Ladakh and the Karakoram. Between Astor and Deosai is the largest occurrence of hornblende granite.



JAMMU AND KASHMIR STATE
GEOLOGY, STRUCTURE, ROCKS

AFGHANISTAN
NOT SURVEYED
PAKISTAN
CHINA
INDIA
N. S.
PANGONG TSO
SPANGGUR TSO
TIBET
CHINA
HIMACHAL PRADESH
PUNJAB
Recent And Pleistocene Deposits
Siwalik And Coastal Tertiary Deposits
Oligocene And Lower Micocene, Eocene
Cretaceous, Jurassic And Upper Gondwana
Triassic, Permo-Carboniferous, Lower Gondwana
Older Palaeozoic, Vidhyans, Himalayan Puranas Cuddapahs
Purana Archaean Granites And Gneisses
Dharwarians Khondalites
Charnockites And Unclassified Crystalline
Deccan Trap (Not Existing)
N. S. Not Surveyed
ADAPTED FROM G. S. I. MAP
BOUNDARY : INTERNATIONAL
STATE

Based upon Survey of India map with the permission of the Surveyor General of India.

Map 2

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There is a diversity of mineral compositions. These are mostly garnet, microcline, obgoclase and tourmaline. In Ladakh cretaceous fossils have been found as far as Yarkand. It is surmised that the entire area of Ladakh formed a cretaceous series with the Hippuritic shells found in some parts.

THE PANJAL RANGE

The eastward extension of the Eocene from Hazara goes beyond the river Jhelum into Kashmir. It joins up with the south-western foot of the Pir Panjal over a distance of 240 km. Right from the river Jhelum to the river Ravi, the Outer Murree thrust and the Inner Panjal thrust are seen with the older Purana schists and states over the carboniferous-Eocene rocks.

The Panjal thrust has driven the nappe zone of the Inner Himalayas far along the horizontal plane. These thrusts have brought about a considerable upheaval. Pre-Cambrian sediments (Salkhala series) with a superjacent series (Dogra slates) forming the floor of the Himalaya geosyncline has risen up as a horizontal sheet fold. The entire Pir Panjal is a series of compressed isoclinal folds strictly autalshorous in their positions. The overfolds of the recumbent type served by recumbent faults are seen passing into thrust planes.

The Panjal range is different geologically from the foothills. It is highly compressed and rocks of various ages have altered from the Purana and carboniferous to Eocene. The axial zone of the Panjal range is mostly composed of the permo-Carboniferous shown in the chart of geological succession below:

Geological Succession of the Himalayas in Jammu and Kashmir

Era	*Age*	*Characteristics*
Aryan	Pleistocene	Low level alluvium of the rivers Jhelum and Indus and their tributaries
	Pliocene	Pebbled beds. Recent Moraines.
	Karewas	(i) Upper Ancient Moraines (ii) Middle 4876 8 m (iii) Lower
	Miocene	Murree Series 2133.6 m

(*Continued on next page*)

Era	*Age*	*Characteristics*	
	Eocene	Nummulitics of Pir Panjal and Outer Hills volcanics of Dras, Ladakh and Burzil	
	Jurrassic	Banihal	Baltal
	Triassic	Upper	1524.0 m
		Middle	3657.6 m
		Lower	91.44 m
	Permian	Zewan Series	243.8 m
	Upper	Limestone of Uri, Reasi	457.2 m
	Carboniferous	Agglomeratic slates	1524.0 m
Dravidian	Middle Carboniferous	Syringothyris limestones	914.4 m
Dravidian	Lower Carboniferous	Muthquartzite	914.4 m
	Silurian	Silurian of Lidar and Sind above	1524.0 m
	Ordovian	Ordovian of Handwara, Lidar above	1524.0 m
	Cambrian	Upper Cambrian of Handwara	
		Lower Cambrian of Shamash Aberia	914.4 m
Purana		Dogra slates	1524.0 m
		Salkha Series	1524.0 m
Archaean	Algonkian	Gneisses and granulites with granite and basic	
Pre-Cambrian	Archaean	Plutonics	

TERTIARIES

Economically the tertiary system is very important in Jammu, Kashmir, Ladakh and Gilgit. The relief features have resulted from the crustal movements in recent geological times. Even the outline appearance of the Tertiary landforms seen now show the evidence of an outburst of igneous forces during crustal movements.

As already stated, tertiary rocks predominate in the outer and lower ranges of the Himalayas in the entire sub-Himalayan zone. The tertiaries of Kashmir show some local peculiarities to the east of the river Jhelum as a result of the retreating Tethys.

In Kashmir the broad classification is Upper Tertiary and lower Tertiary. The extent of width shortens towards the east. In the Upper

Indus basin of Ladakh, the tertiaries appear at some places to the north of the Central Crystalline axis.

The valley of Kashmir is tectonic in origin having formed a part of the geosynclinal Tethys even up to the Permian times. Till then it was a region of calm and quiet sedimentation. The subsequent earth movements within the crust of the region caused an intensive volcanic activity resulting in the Panjal volcanoes extending beyond Ladakh and resulting in a marked topographic unconformity.

The Muth Quartzites are to the west of the Wular Lake. Beyond these are Dogra slates and glacial boulder conglomerates. The Vihi district has a typical lithology of its own markedly seen at Zewan where the Gangamopteris beds are overlaid by a series of fossiliferous shales and limestones containing fossil brachiopods and polyzoa. The Permian is witnessed in the watershed area of the Upper Sind and Liddar Valley normally underlying the Lower Trias.

The Lower Gondwana containing Gangamopteris and Glassopheris are found towards the Golabgarh Pass near Gulmarg, Mahome (Bijbehara) and Nagmarg near the Wular Lake.

The Valley is a synclinal trough between two mountain chains, the deep alluvial having filled the bottom with the alluvium on the bordering mountains.

The oldest sedimentary system occupies Gilgit, Ladakh and the Zanskar range associated with the younger Puranas. They consist of slates, phyllites, schists, quartzites, crystalline limestones and dolomites. They have been named the Salkala series in Kashmir.

To the west of Ladakh, the Greater Himalayan range is composed of the Salkhalas converted into para-gneiss, the Nanga Parbat (8,115 m) massif being almost wholly built of this with intrusive biotite-gneiss of a later age and hornblende granite of a still newer, Eocene or post-Eocene age.

The karewas are fresh-water fluviatile and lacustrine deposits found as low flat mounds bordering the slopes of the mountains above the modern alluvium of the river Jhelum. These karewas cover more than half the area of the valley extending in width from 5 to 24 km over a length of about 80 km to the west. The highest level of a Karewas is 381 m, more than 213.36 m above the level of the bed of the river Jhelum. The material is spread higher up the Pir Panjal. It is believed that at the end of the Ice Age, there was a forest-period in the valley of Kashmir since workable coal seems to occur below the karewas at Handwara.

The topography of the alluvial valley is typical. Floods are common and the river Jhelum with all its tributaries swells and overflows its banks which are higher than the land behind these. Sedimentary surveys have revealed an enormous siltation up to the 2,133.6 m contour. The river Jhelum drains the valley but its bed is shallow with crossbars in the main river because of a coarse sediment which the waterflow in the river is unable to transport. The rise in higher flood level is due to this tendency which is counteracted by raising bunds.

GLACIATION

In Kashmir winter precipitation is mostly in the form of snow. There is no definite snowline in the mountains surrounding the valley. Yet the entire area remains covered with snow for more that three months. On the Zanskar range and the Kunlun range the snowline is higher on the southern slope than on the northern one. There is no perpetual snow on the Panjal range between south-west of the watershed of the Chenab, the Jhelum and the Indus even though the peaks rise above 4,572.0 m. Perpetual snow lies between K_2 (8,615.17 m) Mount Godwin Austin and the southern region rising as far high as 7,620.0 m. A glacier 56 km long can be seen from the Mashebrum Peak 8,615.172 m high. In this region it is the largest glacier feeding the eastern course of the river Shigar which flows through Askole joining its western counterpart at Tandara. To the north-west of Skardu in Rendu in Baltistan glaciers are a permanent feature. This elongated area in the high mountains is glaciated and presents characteristic features of ice action.

The height of snowline in various mountain ranges is given below:

Mountain Range	*Height of snowline (metres)*
Kailas	6,000-7,000
Ladakh	7,000-7,250
Zanskar	5,800-6,750
Dhauldhar	7,000

(Calculated by Burnard and Hayden)

Traces of glaciation are also evidenced between the river Shyok and the river Indus. Since the entire valley surrounded by mountains is covered with snow which begins to melt after March, the upper courses of the innumerable streams show abrupt, alternations of deep precipitous U-or 1-shaped gorges with broad open V-shaped valleys. Though in an immature stage of their development, these high valleys have been rejuvenated again and again with every upheaval of the inner higher ranges. A number of waterfalls, cascades and rapids have been formed on the varying lithological character of the structure of rocks.

The karewas are also covered with snow every year for more than three months when silty clays with sand and boulder-gravel are subjected to snow action. As a matter of fact, these deposits are glacial moraines composed of boulders, pebbles and sands denoting deposits of the warm interglacial periods.

Field study in glacial and periglacial phenomena has been carried out in the Outer sub-Himalayan Zone or the upper Siwaliks belt along the foot of the Himalayas and in the Indus Valley of Kashmir. In order to ascertain the climatic morphology of the Himalayas during the Pleistocene period field study has revealed epochs of Periglacial cold climate (Pleistocene) deposits along the major Himalayan valleys. Traces of old moraines and remnants of terrace systems are spread in many of the major river valleys of the Himalayas.

Field study has been going on since 1862 when Godwin Austin in collaboration with Lydekkar in 1879 proved the existence of the Himalayan Ice Age. The pioneering work in Himalayan glaciation is that of Toll who in 1947 described graphically the Periglacial condition in the Himalayan region during the Pleistocene period. The subject is too vast but the problem of Pleistocene climatic morphology when solved will have a bearing on many geomorpholic problems of Kashmir.

The occurrence of the Quaternary Glacial Cycles the lacustrine deposits called karewas are geological formations of the Ice Age. These overlay the terminal moraines of the first glaciation and are comprised of the two groups, lower and upper, differentiated by the moraines of the second glaciation. The fossil remains of *Elephas hysudricus* found in the lower karewas point to lower Pleistocene Age. Intervening moraines are geologically similar to boulder conglomerates of Potwar region (District Rawalpindiin Pakistan).

Chapter III

PHYSIOGRAPHY

Physiographically, the territories forming the State of Jammu and Kashmir cover a wide area, mostly mountainous, with an outer fringe of alluvial plain bordering the Outer Hill region to the south. Except for the tectonic valley of Kashmir with its lacustrine deposits called karewas, covering more than half the area and some "duns", the territories of Jammu, Kashmir, Ladakh and Baltistan form two distinct physiographic divisions. Ladakh being the largest tract of country including Rupshu, Zanskar, Nubra, as well as Middle Ladakh and the lofty plateau south of Karakorum, has the loftiest inhabited tracts of the world even up to 4.572.0 m above sea-level.

Geomorphologists have studied the varied structure of the territories that form the State of Jammu and Kashmir. The names of H.B. Medlicot, W.T. Blanford and R.D. Oldhan may be mentioned, for their field studies enabled a study of geomorphology which forms the basis for the physiographic divisions of these territories.

THE OUTER PLAIN

Approaching from the Punjab districts of Jhelum, Gujarat, Sialkot and Gurdaspur, a fringe of level land continues with the Punjab plain for more than 240 km. and an average height of 304.8 to 365.76 m above sea-level. This plain is bordered by a low hilly country sparsely wooded and irregularly broken. Subaerial denudation in this region resulted in carving out depressions out of anticlinal tops leaving more rigid and compressed synclinal systems of strata to stand out as elevated ground. A succession of escarpments and dip slopes with broad longitudinal valleys is a conspicuous feature of topography in this region of characteristic Siwalik scenery. Erosion and deposition resulting from the sediments of the Hamalayan rivers are seen in the finer soil covering of the region. The Himalayan region where soil is rich old alluvium but uneven, with very low rainfall and difficulty of water supply, made the area arid known as *Kandi*. This area lies to the west of the river Ravi and to the east of the river Jhelum, with a varying width of 6 to 32 km.

The Outer Plain is full of ravines which receive the flood waters of the monsoon rains, exposing the sandy beds of the seasonal streams which are full of pebbles and boulders. The important rivers or streams between the Ravi and the Chenab are the Ujh and the Tawi. Rainfall in summer flooded the Ujh basin making communication difficult in the past when inflated skins helped to cross the full strong stream. Construction of bridges much above the flood level and deepening of the river bed has enabled communication on the Jammu-Pathankot Road which is now the main commercial and military highway of the State with the rest of the country.

The 762 mm isohyetal line may be taken as the eastern limit of this plain. In recent years when economic development took place within the framework of the successive five year plans of India, this once arid and undeveloped tract of land with difficult communications began to be developed. The recent reorganization of administrative units was necessitated by the geopolitical alterations which the State of Jammu and Kashmir suffered after the partition of the country in the year 1947. This hitherto neglected tract of an arid plain assumed an importance out of all proportion to its resource potential. Smaller physiographic units began to be developed in the interior with modern facilities of communications, transport, electricity, education and credit. The index of this development is seen from an increase in population during the last two decades.

The topography in this region is steadily changing. With the help of machines, waste of soil is considerably checked now as the flow in water is partially under control with a deepening of the streambeds, raising of bunds and use of power for development of small-scale industries. The Kathua Feeder, a canal, used for irrigation on the eastern bank of the river Ravi and the digging of wells appear as factors of importance in the changing pattern of cultivation. With heat in summer, when the temperature rises above 115°F, the growing season is restricted to a very short period limiting cultivation and retarding progress in agricultural yield.

As the altitude rises, the topography changes and the stream-beds become narrower and the hill slopes appear wooded. It is in these narrow alluvial tracts that cultivation has enabled patchy settlement in this land of pebbles and boulders known locally as *Vatanwala*. (boulderbed).

Increase in Population after Administrative Reorganization

Tahsil	*1951*	*1961*	*1971*	*Males*	*Females*
1. Kathua	55,648	63,918	84,254	44,820	39,434
2. Basoli	96,325	107,438	48,699	25,121	23,578
3. Samba	79,842	179,018	114,667	58,975	55,692
4. Ranbirsinghpora	188,713	213,298	156,395	80,212	76,183
5. Jammu	193,723	233,311	338,219	179,432	158,787
6. Akhnoor	102,936	97,165	122,462	62,519	59,943
7. Nowshera	56,730	50,441	79,893	37,877	35,016
8. Rajauri	121,059	121,088	16,491	61,491	55,000
9. Mendhar	84,882	91,524	96,088	50,384	45,704
10. Haveli	62,607	63,008	74,699	39,366	35,533

THE OUTER HILLS

The Outer Hill region is of diverse and complex physiography. The slope is regular with about 3 degrees till it reaches a height of about 2,438.4 m. It ends in an abrupt steep escarpment. These young tertiary hills known as the Siwaliks form a wall separating the Middle Himalayas from the Indian plain of which they form a part geomorphologically but not geologically as these are classed with the plain.

Bare grey standstone with uncovered soil forms the scenery from Basoli to Ramkot. The narrow necks of hills open into small valleys, mostly *duns*, extending longitudinally up to Devsal in the west. The plain is open to the erosive action of running water which leaves no land with uniform level. To the north of the Dansal *Dun*, a longitudinal valley runs on the opposite side of Ramkot enclosed by the Kaarai Thar hills which rise up to 1,524.0 m above sea-level. It is at Dansal that the river Tawi transverses in a gorge with a steep ascent across the main highway to Kashmir.

The physiography of this region shows an extraordinary rate of deposition with undulating topography having an abrupt steepness in the north. As the streams pass through meandering ravines, the surface features appear to have suffered denudation.

The western region of the Outer Hills has a wide expanse with massive conglomerates, boulders and clay. The tributary streams which form the drainage pattern of the river Ravi, the river Tawi and the river Chenab in the Outer Hills region have a special significance in collecting waters to irrigate the plain in the south.

The geological history of the Outer Hills is traced back to the Middle Miocene and Lower Pleistocene. The range of the Siwaliks is believed to go beyond its present limits and even under the alluvium of the Ganges plain.

It is in the Outer Hills that the orthoclinal type of structure appears with a steep scarp on the side facing the plains with a gentle inclination on the other side. The southern limbs of the folds of this part of the Himalayas in their anticlines are faulted steep. Towards the interior, there is compression of synclinal folds with an autochthonous position.

Economically unimportant, the western region of the Outer Hills is vast and varied. It is an immense tertiary mass of irregular cliffs open to view from the Dragari Thar (2,133.6 m) just behind Pauny to the north of Akhnoor. In the western region, the spurs are forested as far down as the Punjab plain. The numerous streams have a regulated drainage which adds to the utility of forests with small patches of grazing ground supporting livestock and raw material for the drug industry. The population is found in small scattered settlements throughout this belt, depending on cultivation of small agricultural patches of alluvial lands in this area extending over 240 km from Basoli near the river Ravi to the Minawar Tawi at Gangwal where it joins the Chenab near Hamirpur.

THE MIDDLE HIMALAYAS

In the State of Jammu and Kashmir, the Middle Himalayas are spread in numerous ranges rising as high as 3,657.6 to 4,572 m above sea-level. There are deep-cut ravines with precipitious defiles all along. This is the characteristic scenery of this elevated physical division of the State known for its scenic beauty and forest grandeur.

More or less converging ranges are intersected by deep gorges through which rivers flow. These rivers are fed with snow from the mountains. The splendid grandeur of varied vegetation is immense. The Middle Himalayas are a rich area of drainage with the upper courses of the river Chenab and its tributaries. There are numerous other streams also in other valleys with local names of their own. Thickly wooded and hidden to the view, these mountains have a writing-desk shape termed orthoclinal which is helpful in preserving soil and supporting thick vegetation. The glory of forests in the Middle Himalayas is, indeed, great.

To the north of these parallel ranges lies the Pir Panjal. The Panjals are, on the whole, composed of permo-carboniferous volcanic rocks. Geologically these mountain ranges fall within the Sub-Himalayan Tertiaries and the older crystalline Inner Himalayas. To the east this physical division is hardly 16 km to the north of Basoli beyond which to the west and north it extends towards Reasi and Rajauri. Beyond, there are only traces of this physical division. There is no continuous mountain mass to be termed a region except beyond Hazara towards Muzaffarbad where the river Kishenganga joins the river Jhelum at Domel.

The Chenab (Chandrabhaga) is a typical river of the Middle Himalayas in the State of Jammu and Kashmir. The entire drainage pattern of this river is directed with its rapids and by the mountain gorge in its upper course from 1,828.8m elevation at Padar where it first entres the territories of the State. From Tandi to Kishtwar, the fall of this river is 10.36 m per 1.6093 km. At Kishtwar, the river Wadwan joins the river Chenab, providing a perennial source of water from the Nunkun glacier. The river flows south beyond Arnas leaving the mountains at Akhnoor—an urban settlement of strategic importance.

There are many small valleys higher up which may be campared to mountain glades where melting snows provide water and grass to the graziers.

Kishtwar is a typical small valley of this type surrounded by peaks over 3,657.6 m above sea-level. Rich in temperate vegetation of oak, pine, spruce, fir and deodar, this physical division has an economic potential. There is great scope for future economic development in this region. The small valleys dot the mountain region at Ramnagar, Bhadrwah, Ramban, Kishtwar, Padar, Reasi, Rajauri and Basoli.

These alluvial tracts look like longitudinal valleys, as in Bhadrwah, where physiography and climate make it resemble Kashmir. Hence this valley of Bhadrwah is called *Chhota* Kashmir (lesser Kashmir).

The longitudinal valley of Banihal though very narrow is to the north of the Pir Panjal and has similar morphological features of a typical Middle Mountain character.

Perpetual snows on the higher elevations of mountains which rise above 4,572 m including the Brahma peak, which rises above 6,400.8 m, form a typical feature. These provide water to the two great rivers in the Middle Mountains. These are the Ravi and the Chenab, which leap in their upper courses from one snowbed to another. It is only the narrow valley bottom which shows definite signs of mature topography exposing gravels in rock cuts as seen in Ramban where the Chenab is crossed by a bridge.

The economic importance of this physical division is at premium with exploitation of its forest resources and prospects of mineral wealth. As a source of hydro-electric power, this region has a sufficient potential. With the development of electricity in this mountain region, skilled labour and mechanical devices will bring about considerable change.

Since the entire traffic to the valley of Kashmir and beyond is to pass through the Middle Mountains, its cool salubrious climate helps tourists to enjoy the scenic beauty and the mountain grandeur of the region.

Beyond the Pir Panjal after crossing the Jawahar Tunnel at 2,194.56 m above sea-level, the beautiful valley of Kashmir is open to view. Enclosed by high mountain chains on all sides except for certain passes and a narrow gorge at Baramulla, the valley is the drainage basin of the river Jhelum and its tributaries. This valley is a wide *dun*, tectonic in origin, like other sub-Himalayan *duns*.

Geologically the valley underwent many changes in geological times. Having formed part of the geosynclinal Tethys even up to the Permian time, when it was a region of a calm and quiet sedimentation, it suffered many violent changes. The mountain wall abruptly rising on sides presents a varied geological scenery in its massive quartzites and Silurian to the west of the Wular Lake. Glacial boulders, conglomerates and dogra slates appear beyond the Baramulla gorge towards Hazara. The span of the Jhelum is hardly 3.04 m at Baramulla where it enters the narrow mountain gorge. Geomorphology of the valley is of interest towards Zewan where fossiliferous shales and limestones are common. The valley of Kashmir presents a rich field of study for earth scientists to whom its field study will reveal much of interest.

The valley of Kashmir presents an interesting morphology. It has no phyiscal monotony to tire the eye found in such morphological features like the valley of the Ganges or the plain of the five rivers of the Punjab. The particular charm of the Kashmir Valley is its sudden rise in altitude which lends it a changing colour of flora and fauna so charming to the eye and pleasing to the mind. The scenery is ever changing from nook, knoll and dell till the high mountains shimmering with snow are reached.

Rising from the lowest height of the Jhelum River to the east, west, south and north undulating slopes covered with grass, and often wooded, appear like small valleys bounded by spurs from the high ridge with hills behind. It is proper to follow the streams in their upward ascent as these form the tributaries to the Jhelum River—a network of altitudinal drainage often fed by small snow-ice sheets in shady ravines above snowline flowing through crevices and banging valleys.

From the air the entire valley looks like a swamp with green patches here and there punctuated, as it were, with dwellings of mud, wood and grass except the city of Srinagar and its environs where the houses edge the Jhelum River as it winds its way under the bridges that connect the western and eastern sides of the city, guarded as it were by the fortcapped hill of Hari Parbat and the rocky-temple-covered hill of Shankaracharya. It is in this vale that the poet sang :

If there is heaven on earth
It is here, it is here!

Even now those who live in solitude sing of its beauty and it is only in recent years that economic planning has been realised as a factor of the peole's happiness. How far development has taken place is to be reckoned now that the Fifth Five Year Plan has successfuly completed its course for development.

The Kashmir Valley

The valley of Kashmir has an area of 15,853.00 square km. More than 259 sq. km. area in the valley are under water. Throughout the valley lacustrine Karewas protrude out of the mountains and look like dry tablelands presenting a sterile appearance pierced by ravines. These shelving shores of an inland sea, as geologists tell us, rise to a height of even 396.24 m above the level of the valley which is 1,828.8 m above the sea. This type of topography extends over about 180 km from Shopian to Baramulla. Below the 1,828.8 m contour, the flood plain of the river Jhelum is often renewed by silt deposited after the water level recedes.

Ancient legend and popular tradition have it that the valley of Kashmir was occupied by a lake called the *Satisar*. The karewas are the remnants of this lake and confirm this view. As a result of earth quakes, the city of Samdimat Nagar, capital of King Sunder Sena, was submerged, and water filled the area forming the Wular Lake, the largest fresh water lake of India.

The karewas are mostly to the west of the river Jhelum where these tablelands attain a height of 381 m from the level of the valley. These karewas protrude towards the east and look like tongue-shaped spurs with dead ravines. Some of these karewas are seen at Tapper, Tangmarg, Damodhar and Gogjipather (Nil Nag).

The slope of the surrounding mountains round the valley of Kashmir is gentle. Cultivation has, therefore, extended higher up, enabling an observer to see the demarcation contour between the plain and the mountain. Settlements have also spread in higher elevations where rich soil with nitrogenous content and water is available for cultivation. Cultivation is limited only by the extent of alluvial margins of the sloping lands. These are the tributary valleys of the river Jhelum. This drainage pattern forms a significant physical feature of the valley.

Lolab Valley

The Lolab valley is about 6.4 km long and 4.8 km wide. Many streams are snowfed and flow from high elevations which are thickly forested. There are patchy meadows, grooves and walnut trees below. This beautiful valley is to the north of Baramulla. The Lolab valley is reached across the Pantsal. Beyond is an ascent of 91.4 m through a lovely forest ridge with a beautiful view of the Kaji Nag Mountain. Deodar trees predominate above Drugmul towards Patalnag, Kumbrial, Doras and Alsu. There are numerous small *nullahs* (streams) decked with forest and glades. Many mountain routes connect one another at one place or another over the spurs and through the ravines between Harwan, Handwara, Nagmarg and Sopore.

Sind Valley

The Sind Valley is the most beautiful tributary valley of Kashmir. It is about 96 km long. Large boulders, granitoid gneiss, are common as the altitude rises in this valley which narrows higher up forming gorges. Rock polishing and grooving is commonly seen with typical roche mountains. A typical place in this valley is the village of Hari, 1981.2 m high on the way to Sonamarg where the moranic material forms the main feature. To the west of the Sind Valley alluvium is spread, widening to the point where the Sind joins the river Jhelum at Shadipur. Glaciation has left marks of ice action in this side valley where there is evidence of ice action in topography.

The mouth of this beautiful valley known for its natural scenery is a health resort known as Ganderbal reached by road and through the Anchar Lake or from Shadipura long the Sind Nala (stream) in a few hours. It is also connected by road to the Dal Lake. The valley terminates at Zoji La Pass from where the barren territory of Ladakh begins.

The moranic glade of scenic beauty is Sonamarg with its terminus at Baltal beyond which the physiography changes. To the north of this pass lofty mountain ranges cut off almost all moisture and the extreme condition of dry cold begins to appear. It is the Harmukh, 5,142.134 m that guards the valley of the Sind.

Lidar Valley

The first upland valley to the east of the river Jhelum is the Lidar. Ice action has characterized topography in this valley of diverse natural scenery where there are glacial streams and terminal moraines. Rock polishing and grooving on the cliff faces of rocks appear with buff-coloured soil of glacial origin. Above 1,981.2 m, morainic debris covers rocks on lower elevations. Cultivation has spread on the banks of the Lidar. The entire length of 64 km leading to the Kolahai and the Sheshnag streams which form the Lidar are fed with snow and ice. Rock polishing with thick morainic material is mostly seen beyond Pahalgam towards Aru and Ledrwat. Towards Kolahai thick morainic debris is covered with grass where glades are used by graziers. The steep sides of the valley show marked ice action with pretty waterfalls till the Kolahai glacier appears with its ice cave embedded in its snouts at a height of 3,413.76 m.

The glacier widens in the rocky interior where in summer a study of ice as an agent of land erosion and sculpture can be made.

INNER HIMALAYAS

The Valley of Kashmir narrows itself towards the north with the massive structure of the Kaji Nag range. The Pir Panjal range of mountains continues to the west of Gulmarg over a distance of 96 km with a varying height ranging from 2,743.2 to 3,657.6 m above sea-level. A road crosses the Haji Pir Pass from Uri to Punch through a mountain gorge broken by cliffs and covered with deodar forests.

The Great Himalayas or the innermost line of the high ranges rises above the limits of perpetual snow with an average height extending to 3,048 m with peaks like the Nanga Parbat (Diyamir 8,107.68 m). The central Himalayan axis bifurcates near Kulu with its north-westerly branch known as the Zanskar Range reaches the two peaks of Nun Kun 7,055.1 m. The Dhauladhar Range extends farther to the north-west.

Some of the important passes in the Panjal, Great Himalayas and the Karakorum mountains are given below :

Passes in the Himalayas

Name	*Height*
Panjal Mountains	
Pir Panjal	3,494 m
Bundil	4,200 m.
Banihal	2,832 m.
Great Himalayas	
Zoji La	3,529 m
Chilung La	4,401 m
Umasi La	3,294 m
Sarsank	5,716 m
Poat La	5,716 m
Singo La	5,097 m
Baralacha La	4.891 m
Karizam La	4,551 m

Karakorum Mountains

Name	*Height*
Korakorum pass	5,352 m
Muztagh pass	5,706 m
Siala, Bilatoud La	5,432 m
Marpo La	5,611 m
Sasar La	5,300 m
Karakorum Pass	5,575 m

The Hindukush and the Karakorum ranges form the watershed to the Central Asian drainage flowing into the Indian Ocean. The north-eastern ranges of mountains appear in deep gorges beyond the middle Indus. It is a high-level plateau, a desert utterly devoid of vegetation. As the altitude rises very much and majestic peaks appear; K_2 on the mighty Karakorum (Mustag range) attains the culminating height of 8,615.172 m above sea-level. It is the second highest peak in the world. These mountain peaks contain the heads of the Boltore glacier and these ice fields cover about 129.50 sq. km. giving rise to the river Hunza which joins the river Gilgit. Ladakh is the largest tract of country in the territories including the Rupshu, Nubra and Zanskar.

The valley beds in the north-west descend on the mountains till Gilgit is reached. It is a small valley cut down to 1,524 m above sea-level. To the north and north-east, this river valley has a wide flat slope, like the flat plain of the Deosai (3,962.4 m) and Lingzhitang 4,876.8 m. Ladakh is an area of mesozoic sediments towards the northern flanks of the Zanskar mountains. Gilgit, Hunza, Nagir, Chilas and Chitral form Dardistan.

DRAINAGE PATTERN

RIVERS

Rivers have a special geographical importance in the territories of Jammu, Kashmir, Gilgit and Ladakh. The entire drainage pattern has resulted in land erosion and sculpture of diverg ent types of topography. Mountain-building movements of the later Tertiary Age in the Kashmir Himalayas have characterized the development of the river system, in its processes of erosion and transportation. Deposition, however, has created a nucleus of culture and civilization. In this region, the rivers are older than the mountains they traverse.

As the mountains began to be formed by folding, contortion and upheaval of the rock-beds, the old rivers kept their own channels with greater force of erosion. This characteristic feature of geography bears testimony to the inconsequent drainage of this region. This type of drainage is spoken of as an antecedent drainage in which the main channels of flow were in existence before the present features of the region were impressed on it.

No geographical account of the Himalayan system is complete without mention of hanging valleys or side valleys through which the river tributaries flow at heights of several hundred metres from the main river valley. More active erosion and more protection by glaciers are the two factors advanced for the phenomenon of hanging valleys which are a singnificant geomorphic feature for a study of drainage pattern in the territories forming the State of Jammu and Kashmir. The distribution of the drainage pattern is given below;

The Ravi

The Ravi, (Irāvati in Sanskrit and Hydrotes in Greek), is the smallest of the rivers of the Punjab. It drains the southern slopes of the Pir Panjal range and the northern slopes of the Dhauladhar Range. The river Ravi leaves the Himalayas at Basoli and passes close to Kathua near Madhopur where it enters the plain of the Punjab. This river is 640 km long.

The Ujh is a typical siwalik stream collecting drainage from the siwalik hills in the summer months when monsoon rains flood these small valleys.

The alluvial detritus derived from the sub-aerial waste of the mountains is swept down to the plain.

The raising of bunds and the construction of bridges over the flood level with the opening of the Jammu-Pathankot Road has given importance to the Outer Hills of the Himalayas and the siwaliks in the State of Jammu and Kashmir. Besides, it has commercial importance, being the only trade link with the rest of the country now with a 108 km long railway connecting Pathankot with Jammu. This railway and road are of vital importance for traffic, trade and defence.

Place	*Springs*	*Lakes*	*Rivers*
Jammu		Mansar Surinsar Sanasar	Ravi Ujh Tawi Chenab
Kashmir	Verinag Kokarnag Achhabal Martand Cheshmashai Behama Tulmulla Nilanag, etc.	Dal, Anchar Hokarsar Mansabal Wular Kaunsarnag Gangabal Tarsar Marsar Sheshnag Anantnag etc. etc.	Jhelum Lidar Vishav Rambiara Sukhnag Dudganga Sind Ferozepur Nala
Ladakh	—	Pangong Tsomoriri	Sind Shyok Zanskar Yarkand

Tawi

The Tawi is a typical river draining the Outer Hill region. It flows round the city of Jammu after collecting drainage to the north-east of Jammu in the interior mountains. At Udhampur "dun" where the Tawi takes a bend, the waterlevel has been raised to create a waterfall for generating electricity. After the late Tertiary when the direction of the main rivers of northern India changed, the drainage on the siwaliks and Outer Hills of the entire Himalayas became consequent.

Chenab

The Chenab river rises in the Himalayan contour of Lahaul and Spiti. Two streams, more or less parallel, the Chandra and the Bhaga, form the Chandrabhaga, or, the Chenab. The Chandra issues from a large snow-bed on the south-east of the Baralacha Pass 6,096 m above sea-level. The Bhaga issues on the-north west slopes of the Baralacha Pass. The Chandra deviates to the north-west to a distance of about

168 km meeting the Bhaga at Tandi. The Chandrabhaga (Chenab) thus formed flows through the Pangi valley in the State of Chamba and then entres the district of Padar in the State of Jammu and Kashmir. From Tandi to Kishtwar, the fall of river is 10.36 m per km. The Wadvan river from the north joins the Chenab at Kishtwar with its perennial source of ice and snow at Nun Kun. The Chenab flows to the south from Arnas and leaves the Himalayan mountain, 288 km from Kishtwar. The river-bed is just 60.8 high at Akhnoor with mostly limestone cliffs where the river comes out in the plain of the Punjab.

The Chenab is a typical Middle Himalayan river. It has rapids in its upper courses and deep gorges cut through the rocks, as can be seen at Ramban at a level of 762 m. where a bridge connects the two banks of the Chenab.

LAKES

A number of lakes are found in the State of Jammu and Kashmir. Majority of these lakes in Kashmir are of glacial origin. The Trans-Himalaya lakes are diminishing in volume whereas their salinity is increasing. These are Tso Morari, Kyum Tso, Kiagar Tso and Kar Tso.

In Jammu Province there are some small lakes.

Mansar

Mansar is a small lake 50 km to the south of Jammu. It is 2½ km long and 1½ km wide. There is a rich growth of mango trees round the lake which has tortoises in water. Recently the spot has been developed for tourists.

Surinsar

Surinsar is smaller than Mansar. It is about 8 km to the west of Mansar. This small lake is about 1½ km long and ¾km wide. Its flora and fauna are similar to that of Mansar.

Sanasar

Sanasar (1650 km) is a very small lake 17 km to the north of the Patni Top on the Jammu-Srinagar road. There are pine and deodar trees surrounding this lake with a sanatorium on its site.

KASHMIR PROVINCE

Jhelum

Drainage remains the vital problem of the valley of Kashmir where gravitational irrigation, mechanical by nature, has been the main factor of development.

The river Jhelum called the 'Vyath' in Kashmiri, *Vetasta* in Sanskrit, Hydaspes in Greek and Biduspes of Ptolemy, form the main arterial system of the valley with its affluents, canals and lakes. The basin of the river Jhelum is a trough formed between the Great Himalayan range and the Pir Panjal range. Oval in shape the diameter of the valley runs parallel to the general direction of the two ranges for about 144 km. The alluvium, with which the valley is filled, has a depth of 1,828.8 m which according to geologists gave shape to a unique geomorphic character in the form of lacustrine and fluviatile karewas bordering the margins of the mountains surrounding the valley.

The following table shows the length and area of the drainage basins forming the tributary pattern of the Jhelum system.

Drainage basin	*Area in square kilometres*	*Length in km*
Lidar	1242	680
Sind	1560	776
Vishav	830	450
Rambiara	760	380
Ramushi	462	265
Dudganga	600	240
Sukhnag	540	230

The river Jhelum has its important source in the lake of Sheshnag at the head of the Lidar tributary. The parent stream has its source in a spring of deep blue water at the bottom of a spur in the Pir Panjal, just below the Jawahar Tunnel connecting the main highway, wherefrom the beautiful octagonal spring is seen like an emerald set in green pines.

For 25.6 km till Khanabal is reached, the Jhelum from Verinag is a thin stream which even a hen can cross. It is the Lidar from the lake Sheshnag, flowing from the east through Pahalgam that makes the river navigable. Further north, the Jhelum behaves like a clever financier building its capital on the wealth of others. The river Jhelum is, therefore, a tributary river, par excellence.

Vishav

The Vishav is an important tributary fed by the lake Kaunsarnag. It joins the Jhelum below Bijbehara flowing down from 3,962.1 m to 304.8 m after irrigating the Kulgam area which is the rice-bowl of Kashmir in the south. A picturesque waterfall at Aharbal lies in this area.

Rambiara

The Rambiara is another tributary from the Pir Pass. In its upper course logs of timber are floated down to make rafts.

Ramushi

The Ramushi is yet another tributary of the river Jhelum. It flows from Kharmarg and takes the form of a river at Pakharpur. In its tributary valley irrigation facilities are available even in the higher elevations of lacustrine uplands and alluvial land below.

Sukhnag

The Sukhnag collects drainage from the neighbourhood of Gulmarg and its environs.

Dudganga

The Dudganga flows from Ludurmarg in the central Pir Panjal near the Tatakuti mountain in two streams, the Sang-Safed and the Yachera. The Dudganga flows to the south of Srinagar. The Ferozepur Nala flows in the western mountains of the Baramulla-Gulmarg area. There are many springs with ice and snow below the Apharwat (4,419.6 m), Khilanmarg, Alapather, Gagrimarg, Banilanag (5,974 m) and Kantarnag (4,114.8 m) are located in this area.

Sind

The Sind is an important tributary of the river Jhelum. The traditional source of the Sind is in the sacred lake known as Gangabal on the Harmukh mountain. The headwaters emerge at the Zoji La and the Amarnath peak in a limestone cave. In its 96-km course, the Sind drains the loftiest mountain till it joins the Jhelum at Shadipur. This tributary has a delta near its confluence extending over a large area mostly swampy with sandy loam given to cultivation. The Sind enters the swamp to its east into the lake known as Anchar near Ganderbal. The Jhelum flows but its water levels regulated by a weir and a gate where the water from the Dal Lake flows out into the river through the Apple Canal (Tsunti Kul).

The Dal Lake

The Dal Lake is the flood lung of the Jhelum filled with water when the river Jhelum is in flood.

The Flood Spill Channel

The Flood Spill Channel was constructed in 1904 to relieve the load of water on the river in the city of Srinagar, taking off one-third of the total flow in the river. The Jhelum flows in loops over the river plains apparently quite level with a uniform slope. Anantnag is 45.72 m higher than Srinagar and Sopore is 16.764 m lower than Srinagar.

The Wular Lake

The Wular is the largest fresh-water lake in India about 16 km long and 9.6 km wide. The river Jhelum enters it from the south-east and leaves it to the west near Sopore, which is a typical delta-town formed by siltation. Small streams like the Harbuji, Arrah, Erin, Pohru and Bandipur flow into this lake. The river Jhelum becomes shallow and sand banks appear in the river-bed obstructing navigation. It is only in spring (May-July) that rainfall causes the snow to melt at higher elevations on the surrounding mountains and causes floods. The river Jhelum has, therefore, been described as both a blessing and a curse.

Harmukh Mountain Lakes

Brahma *Sar* is a shallow lake at the foot of the Hamsa Dwar (swan gate) 4,105.3512 m abover sea level.

Sokh and *Dokh* are two frozen lakes said to be two tears of

Parvati, the consort of Siva, one a warm tear drop signifying happiness the other a cold one signifying grief.

Gangabal lake (3,570.427 m) is about 8 km in circumference and 270 m in diameter. The majestic surroundings of high naked jagged peaks rise as high as 1,524 m above the water level of the lake surrounded by crevassed glaciers. There is multifarious floral beauty making the spot beautiful and attractive.

Beyond Bahramgol at Baramulla where the river is hardly 61 m wide and 3.048 m deep flowing between the almost perpendicular mountains, the Jhelum enters a narrow gorge through which it flows a distance of 128 km till it reaches Muzaffarabad (Domel) to join the river Krishenganga which drains the northern rim of the Kashmir basin in Telel, Gurez and Sharda. At Uri the river changes its course and follows the direction of the mountain ranges towards Muzaffarabad 752.856 m with a·fall of 10.0584 m per kilometre.

Krishenganga

The Krishenganga is a river with its source in the valley of Telel and Gurez in the mountainous tract of Dras. The river passes through Keran, Karnah, Teetwal and Ghori. It joins the river Jhelum at Domel near Muzaffarabad. A river flowing fast in a deep mountain gorge cannot be navigable but only helps in floating logs of timber from the forests of Dras, Keran, Keran, Karnah and Sharda.

The Indus

The largest tract of the territory in the State of Jammu and Kashmir is Ladakh, Baltistan and Gilgit. Ladakh includes Rupshu, Zanskar and Nubra which are about 2,743.2 m above sea-level surrounded by barren mountains mostly Archaean. The river Indus passes through a barren land of granites, granulites, gneisses, phyllites and schists. The upper Indus enters the State near the Chinese frontier between low sandbanks in a open valley. Descending several thousand metres the river Indus enters a narrow, almost inaccessible gorge with alluvial patches on sides where cultivation and settlement are to be found here and there. Cultivation is possible even up to 4,267.2 m above sea-level and is spoiled only by an early snowfall.

The Indus river has a wide catchment area in the territories of the State of Jammu and Kashmir.

The Indus river in Kashmi r	*Catchment are in Sq. Km.*
Shyok	33,410
Gilgit	20,464
Zanskar	20,464
Dras	12,769
Shigar	12,769
Indus	268,907
Jhelum	34,947

At Leh the discharge of the river Indus is calculated at 6,000 gallons per second in winter and 3,400 gallons per second in summer. The Zanskar is a tributary of the river Indus which joins it below Leh.

Towards central and sout-east Ladakh, there are many sedimentary tracts extending up to the lofty plateau of Karakorum. The Indus passes through a deep gorge with the river Shyok and equal discharge of water flowing parallel to the river for 240 km in a north-westerly direction. The Great Himalayas end at Nanga Parbat (Diyamir), the orographical focus where the river Indus circles round it.

Lakes in Ladakh

The Pangkong is a salty lake in Ladakh. It is about 6.4 km long and 3.2 to 6.4 km wide at a height of 4,267.2 m above sea-level. Another lake is known as Tsimoriri in Rupshu. It is about 24 km long and 3.2 to 4.8 km wide, formed by the damming of old river courses when the growth of alluvial fans was caused. There are also some small lakes like the Patlong, Thaled, Longzang and Pangor.

Chapter IV

CLIMATE AND CLIMATIC REGIONS

CLIMATIC VARIATION

The territory of the State of Jammu and Kashmir lies between four degrees of latitude from 32° 17′ to 36° 58′ North within these 643.74 km, there is a sudden rise of altitude from 304.8 m to 8611.400 m above sea-level. In winter the violent wind system from the Mediterranean depressions significantly alters the form of precipitation in the Kashmir Himalayas where heavy snowfall is caused from the month of December to the month of March.

The South-west monsoon causes rain only in the Outer Plain and the Outer Hills of Jammu but, when the monsoon is strong, rainfall is also caused in the Middle Himalayas and across the Pir Panjal into the valley of Kashmir. The range of climatic study varies from the tropical heat of Jammu to the semi-Arctic cold of Ladakh. The variability in climate in these diverse territories of the State is so marked that for even a small area it may not be possible to depend on averages for purposes of study of climatic conditions.

Leh (Ladakh) has only a normal annual rainfall of 92.6 mm compared to Jammu's 1,115.9 mm, showing a range of about 1,000 millimetres.

A careful study of the map of India will reveal that the territory of Jammu and Kashmir forms a transitional region of diverse physical features. Lying between the weak influence of the monsoon region of the Punjab and cold dry Tibet with a small amount of precipitation, strong winds, intense sunshine and rapid evaporation, the upper Sind Valley with its parallel mountain ranges running west to east has more or less a semi-Tibetan type of climate.

Altitude and prevailing winds have given this entire region a marked variation in climate.

The south-west monsoon in summer, though exhausted, strikes the Middle Mountains and some of the winds cross even the Pir

Panjal when the monsoon is strong. A line drawn from Uri to Punch and then along the southerly edge of the Pir Panjal near 33° North Latitude forms the wind divide.

In winter cyclonic disturbances from the Mediterranean cross Iran and Afghanistan and bring heavy precipitation to these territories mostly in the form of snow. It is this snow which keeps the entire Jhelum valley and the surrounding mountains under snow for about five months. With a rise in temperature after March the snow begins to melt.

No definite classification of snow zones is possible. The entire mountain zone of Ladakh has snow for three months which melts or is drifted by winds. Beyond Latitude 35° North snowfields assume the shape of glaciers and widen from east to west in these lofty mountain ranges.

SNOW MAP

An attempt to prepare a snow map of Kashmir was made as early as 1807. In fact while tracing the sources of the Himalayan rivers, information was collected about the geography of higher altitudes where snow accumulates.

In the valley of Kashmir surrounded by high mountains on all sides winter precipitation is mostly in the form of snow. After a heavy snowfall the entire valley looks white except for certain perpendicular peaks. Snow begins to melt after March towards higher elevations and by July rain and rise in temperature melt ice lying on slopes facing the sun. It is only in some shady ravines that patches of ice last till October, as such there is no definite snowline which is the lower limit of perpetual snow resisting the heat of summer. The snowline, therefore, is never horizontal. It moves upwards in summer and downwards in winter as determined by temperature, topography and direction of wind. Winter precipitation is of immense economic importance and is very much valued in Northern India as these cold weather storms are of considerable argicultural importance. The rainfall determines largely the character of the great wheat crops of Northern India, and they provide the chief part of the snowfall whose melting feeds the irrigation canals during the hotter months of the year.

On the Zanskar range and on the Kun Lun ranges the snowline is higher on the southern slopes than on the northern. This is not so on the Great Himalayan range where the snowline on the southern slopes is lower than on the northern.

Richard Strachey, in the middle of the nineteenth century, explained the presence of a lower snowline on the northern than on the southern Himalayas by some thousand feet exposed to the full force of the monsoon from the Indian Ocean. The lofty Himalayas check the monsoon from the north where there is very little of snowfall. Both R.D. Oldham, the veteran geologist, and Strachey an eminent explorer-geographer ascribe the dryness of Tibet to the rise of the Himalayas which cut off monsoon moisture from crossing over the Himalayas to Tibet. Sevn Hedin also supports this view.

The following table shows how far winter precipitation, mostly in the form of snow, is spread over in the valley of Kashmir and to its north-west and east. Very little precipitation occurs towards the east, as the lofty mountain ranges of the Haramosh and the Muztagh, as far south as 35 North latitude, allow very little of moisture to be carried to Ladakh.

Kashmir, Ladakh, Dardistan

Station	*Height in Metres above sea level*	*Monsoon rain in mm*	*Winter rain in mm*
Leh	3352.8	50.8	25.4
Skardu	2133.6	50 8	127.0
Kargil	2743.2	50.8	177.8
Gilgit	1524	76.2	50.8
Dras	3048	127.0	406.4
Sonamarg	2438.4	254.0	1295.4
Srinagar	1524	279.4	381.0

(*Note :* rain 25.4 mm=snow 0.3048 m)

Most of the snow falls during the winter and spring months; some snow falls even in May and June from these depressions in higher altitudes in the mountains. These also give winter rains in the plains of northern India. The south-west monsoon from the Arabian Sea causes rain and snow in August and September over 3352.8 m above sea level on the western and southern slopes of the Haramosh.

Weather Conditions in Baltistan

Date	*Locality*	*Altitude in Metres*	*Minimum temperature °F*	*Weather*
August 14 to 17	Kashmir	2438·4	49	Fine
August 18 to 19	Krishenganga valley	3352.8	46	Rain
August 25	Astor, Bunji, Gilgit valley	1828 8	76	Fine
August 26 to 28	Haramosh west slopes	3352.8	31	Fine
August 29 to Sept. 1	Haramosh west slopes	3048.0	35	Rain and snow fine
Sept. 2 to 4	Haramosh west		38	Rain or snow daily
Sept. 5 to 15	Haramosh west	3352 8	34	Fine
Sept. 16 to 17	Haramosh slope	3352.8	27	Heavy rain and snow
Sept. 18 to 25	Haramosh slope	3657.6	22	Fine
Sept. 26 to October 11	Astor Kamri Pahalwar Gilgit Valley	3657.6	26	Cloudy rainless

To the north of the Indus Valley and to the east of the Gilgit valley even August and September are under continual cloud and rainfall with snow caused above 3352.8 m. But the valleys of Gilgit and the Indus have bright sunshine. Since it is not possible to make meteorological observations above the snowline it is usually accepted that 25.4 mm of rain denotes 0.3048 m of snow. Lofty mountains above 6097 m are spread over from Nubra towards Kun Lun where the snowline is at that height. The entire precipitation on the Kashmir Himalayas from ending October to ending April is generally believed to be in the form of snow.

As a matter of fact, contemporary glaciation presents interesting features. More than thirty glaciers are spread over here and there of which only two have real valley gorges, the lowest at 3352.8 m. Most of these are simply cakes of ice in wide cirques which form the collecting grounds.

Frederic Drew has admirably shown the following different zones of snow in his map prepared in 1875.

(1) Areas of snowfall in ordinary years.
(2) Areas where snow falls and stays for less than three months.
(3) Areas where snow falls and stays for more than three months but does not produce glaciers.
(4) Areas where snow falls and glaciers are formed.

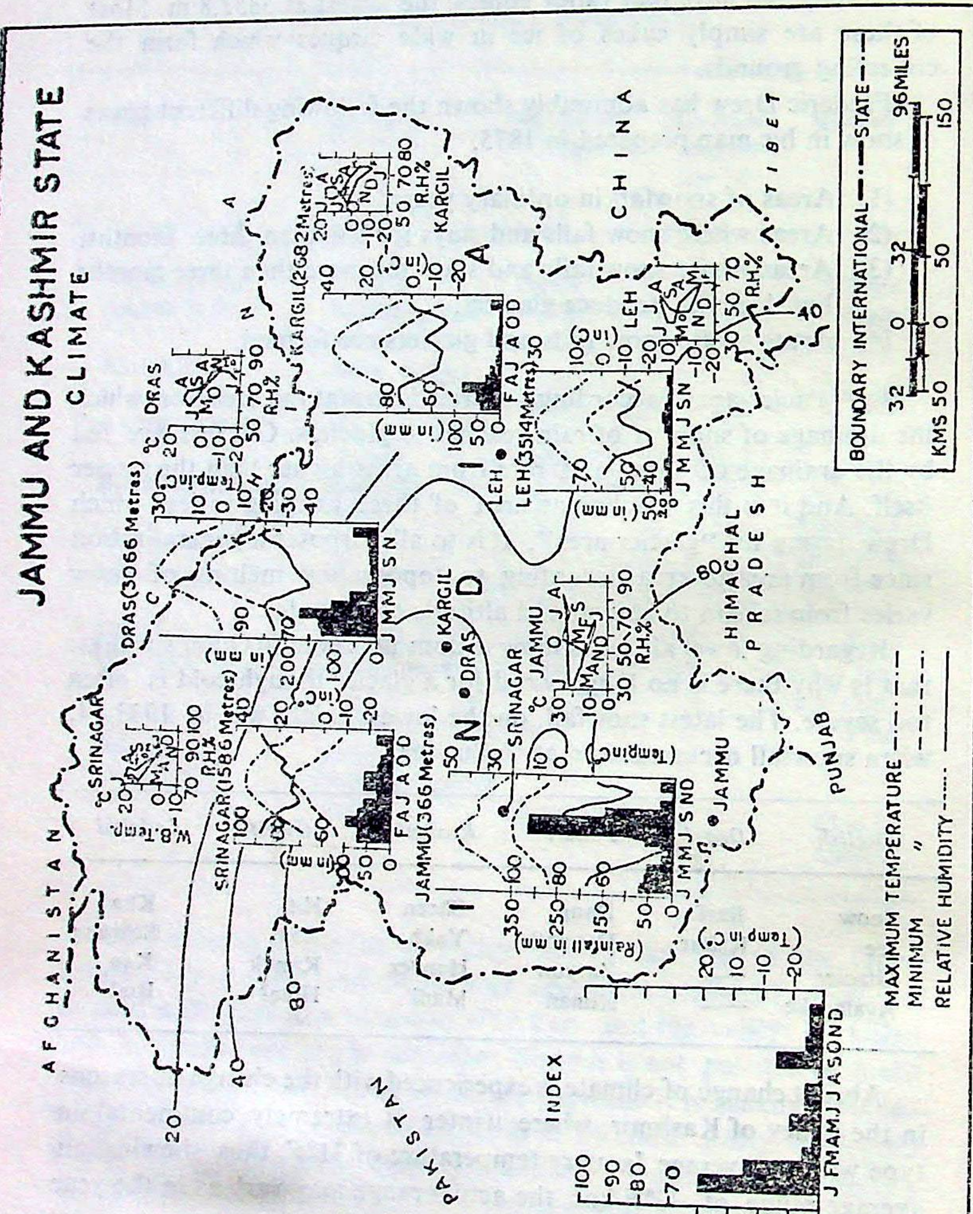
By "glacier-area" according to Drew is meant the area from which the drainage of snow or of rain reaches to glaciers. Glaciers are fed by the drainage of snow and rain from areas higher than the glacier itself. And it is this catchment area of these hanging valleys which Drew terms as "glacier-area". It is to all purposes a generalization since from area to area according to topography melting of snow varies from season to season and altitude to altitude.

Regarding lower altitudes snow seldom falls even in Outer siwaliks; that is why there is no Dogri word for a glacier though cold is often too severe. The latest snowfall, on the lowest height was in 1973-74, when snowfall occurred even at Jullunder.

English	*Dogri*	*Pahari*	*Kashmiri*	*Gilgit*	*Ladakhi*
Snow	Barf	Dang	Sheen	Hit	Kha
Ice	Kakar	Dangoth	Yakh	Sov	Schrung
Glacier	—	Zaryun	Hander	Kimuk	Kan
Avalanche	—	Himan	Mani	Hinal	Rud

Abrupt change of climate is experienced with the change of seasons in the valley of Kashmir, where winter is extremely continental in type with an average January temperature of 31°F thus showing an average range of 42°F but the actual range may vary as in the year 1953 when it was 94°F.

Leh is the main town of Ladakh. It has extremes of climate. The sun rises in a clear sky and warms the ground and then the air gets heated immediately. Oppression of lower layers of the atmosphere is



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Map 3

felt with the declining sun when a keen searching south-west wind gradually dies away and in the still night the ground loses heat and severe frost occurs by morning. The total annual rainfall in Leh is only about 76.2 mm.

These varying characteristics of meteorology show how far altitude, direction of mountains, velocity of winds and inclination of the rays of the sun influence the average weather conditions in the diverse regions of the State.

CLIMATIC DIVISIONS

The Tropical

The Outer Plain and the Outer Hills may be grouped into one single climatic region. The province of Mirpur is to the extreme south, bounded by the Siwaliks towards its margins and the important Nawanchhoch Ridge, a barrier against the hot dry winds of the Punjab and its dust storms. The total rainfall is about 1051.155 mm increasing towards the north where the winters are snowy. After the month of March, as in the rest of the Punjab, days become hotter and nights warmer. Temperature comes down after summer rains. August and September are malarial. Local winds blow from the Chenab valley towards the south, resulting in lowering of temperature.

Rainfall in Millimetres

Months	*J*	*F*	*M*	*A*	*M*	*J*	*J*	*A*	*S*	*O*	*N*	*D*
Mirpur	48.5	87.1	38.6	159.0	35.8	45.7	246 0	254.0	25.8	25.4	25.4	
Basoli	56.8	13.90	65.8	6 43	25.7	66.5	426.9	471.0	70.8	89.0	0584.2	

Beginning from Kathua in the east, a sub-tropical climate with variation prevails especially in regard to temperature and humidity. Rainfall occurs from July to September, when there is an outbreak of malaria which, however, is now very much controlled. The *Nalas* and *Khuds* are full of water in the rainy season but are hot and dry in other months of the year.

Jammu, a typical foothill town in the Outer Hill region, has an annual normal rainfall of 1,115.9 millimetres and its monthly variation is given below :

Rainfall in Millimetres

Months	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*
Jammu	64.8	64.3	56.4	316.85	23.1	69.3	327.4	29.5	123.1	1.55	6.6	33.0

The climate found in the zone of the Middle Mountains and the valleys enclosed is of a particular type. Altitude determines the degree of coolness and elevation, the form of precipitation and summer temperature. The moisture-laden winds of the summer monsoon cause rainfall in the Outer Hill region but in ascending the Middle Mountains these winds become weak to cause precipitation beyond. The climate in the high-lying valleys along the upper Chandrabhaga—the Kishtwar region—is extremely vigorous with a long cold winter and a very short rise in temperature in summer. In high-altitude-lying valleys, the climate in summer is milder. Snow falls in higher elevations and begins to melt late in April.

Rainfall in mm

Months	*Udhampur*	*Ramban*	*Bhadrwah*	*Kishtwar*
1	88.9	175.2	190.2	144.7
2	104.1	165.0	152.4	147.3
3	73.6	137.1	83.8	139.7
4	53.3	106.6	129.5	109.2
5	91.12	30.4	63.5	53.3
6	83.8	43.1	50.8	43.1
7	393.7	2.54	101.6	76.2
8	355.6	111.7	124.4	86.3
9	91.4	60.9	43.1	27.9
10	15.2	25.4	45.7	50.8
11	15.2	25.4	22.8	10.1
12	68.5	116.8	116.8	33.0

The Middle Mountain region extends in the east from Udhampur to Ramban to Doda and as far west as Punch. It is intermediate in weather conditions compared to the exterme cold in the north and hot in the south. Rainfall varies as the altitude rises and at many places there is very little rainfall on the leeward side.

Udhampur is a typical Middle Mountain region, considerably developed with the important town of that name in its centre on a denuded spur. Rainfall is received here from July to September and is fairly good for forest growth. The winter is mild but bracing.

The spring is also mild and the summer quite warm though at times pleasant.

KASHMIR—CLIMATIC INDICATOR

The valley of Kashmir is conveniently classed into a separate climatic region for its peculiarities in the variation of temperature, precipitation and humidity compared to the regions of the state. Winter lasts up to March and is often severe. The mid-Mediterranean depressions blow over the Afghan frontier after passing over Iran and precipitate in the valley and its surrounding mountains in the form of snow. Spring begins after March and lasts till May. This is the rainiest season of the year. The hottest months are July and August. Summer rains are generally absent because the monsoons are checked by the Panjal Mountain barrier extending over a distance of 80 Kilometres.

To the north and east of the valley of Kashmir the mountains rise higher till the valleys of the Sind, the Lidar, the Vishav, the Rambiara are reached. The monsoon dies out to the south of the Pir Panjal ranges of mountains and the summers have, therefore, very little in common with the general winds and pressure system of India. Bright warm sunshine and bracing winds make the summer hot during the day. The influence of the south-west monsoon at best reaches Uri gorge in the north of Kashmir and generally not beyond.

Humidity is high in July and August combine high temperature causing discomfort. The lakes and waterways which are many in the valley of Kashmir make the atmosphere of the surrounding areas damp and oppressive. The entire valley is covered with a haze which hides the surrounding mountains from view. It is then that continuous hard work is impossible. This state of depression lasts till September but October is the healthiest month.

SRINAGAR

The city of Srinagar is situated in the middle of the valley of Kashmir at 34° North Latitude and 75° East Longitude. Srinagar is at an elevation of 2194.56 m above sea-level. On all sides, the undulating karewas and mountains rise higher and higher to over 3657. 6 m above sea-level. No direct relationship in the atmospheric circulation of India can be traced to it. The Pir Panjal serves as a climatic barrier to the south-west monsoon and the north-east mountain ranges check the cold blasts of Ladakh. The city of Srinagar has a temperate-cum Mediterranean climate peculiar in some respects and having winter conditions of the continental type.

The year is divided into six seasons of two months each :

Kashmiri	*English*	*Duration*
Sonth	Spring	March 16 to May 15
Grishim (Retkol)	Summer	May 16 to July 15
Wahrat	Rainy	July 16 to September 15
Harud	Autumn	September 16 to November 15
Wand	Winter	November 16 to January 15
Sheshur	Ice Cold	January 16 to March 15

Within the small geomorphic compass microclimates operate as the altitudinal rise is sudden. The study of change in weather was noted from the very early times when people observed nature's sound and colour calender in Kashmir valley as given below:

Nature's Sound and Colour Calender in Kashmir Valley

Season	*Flowers*	*Birds*
Spring (Sonth)	*Viburnum sternbergla*, Gagea, *Colchicum Luteum*	Swallow, Sterling Hoopoe.
Summer (Retkol)	*Crown imperialis*, Daffodil, Hyacinth, Shepherd's purse	Thrush, Shrike, Cuckoo.
Rainy Season (Waharat)	Sencio, Geranium, Clover, Balsum. Iris	Black-bulbul, Ring-dove, Golden, Oriole
Autumn/ (Harud)	Lotus, Lily, Potentilla, Hollyhock, Crocus	Water Pheasant, Moorhen, Paddybird
Winter/ (Wand)	Zinnia, Thyrne, Chrysenthemum	Laughing Thrush, Bulbul, Jungle crow
Severe Winter/(Shishur)	Wild rapeseed	Chough, House, Crow, Tit, sparrow, Mallard, Shoveller, Grebe

Severe winter extends over 70 days from December 24 to March 8. The entire valley looks like a refrigerator, or, if it is sunny lying in the lap of snowy mountains with temperatures often below zero. The westerly disturbances emanate from the Mediterranean Sea across north-west India and Iran. In 1942, the snowfall measured at 914.4 millimetres when measured as rain; Srinagar recorded 691.38 millimetres of rain in 1943, being above normal by 34.28 millimetres. The following table will show the average rainfall in inches and actual rainfall in the year 1947 along with the actual number of rainy days:

Months	*Actual rainfall in cms.*	*Actual number of rainy days*
1	10.25	3
2	12.10	4
3	9.00	5
4	9.10	1
5	5.95	5
6	3.00	5
7	6.55	6
8	7.05	0
9	4.80	1
10	2.90	2
11	1.10	0
12	3.30	4
Total	75.10	41

In the spring months frequent showers occur and then in summer it is usually in the second week of July that the exhaused south west monsoon when strong, may reach Kashmir causing showers and spend itself in the second week of August.

RAINFALL

July and August are the rainiest months (average 59.182 and 61.468 mm respectively). March and April have an average rainfall of 92.710 mm and are highly useful for agriculture. The number of rainy days varies from 8.0 to 8.1 in March and April. The spring rains melt snows in higher elevations and make flowery Kashmir dull, causing floods in the Jhelum. The average rainfall is about 75 cms with 19 rainy days. Rainfall varies actually from 1106.0 mm in

1930. to 3810.0 mm in 1933. The averages have been calculated from the figures for about half a century. The extent of rainfall region is shown in Map 4.

TEMPERATURE

August is the warmest month in the Valley of Kashmir with a mean temperature of 74.1° and a mean daily maximum temperature of 83.3°F. The highest temperature recorded was 92.9°F in July and the lowest 16°F in January. Increased cloudiness lasts from the middle of December to the end of February. This alone reduces the daily maximum temperature, while the minimum temperature increases due to less radiational cooling during the night. Largest number of hours of sunshine are found in the months of September, October and November, the smallest, of course, in January.

Temperature Chart of Srinagar, 1974

Months	*Mean daily Maximum*	*Mean daily minimum*	*Mean daily temperature*	*Highest temperature reached °F*
1	33.5	24.7	28.3	40.7
2	37.9	27.5	32.7	51.0
3	51.3	35.6	43.5	64.0
4	65.8	47.2	56.5	82.4
5	77.2	51.7	64.5	87.1
6	73.3	55.2	65.5	55.1
7	82.9	62.7	72.8	92.9
8	83.3	64.9	74.1	90.0
9	82.6	54.2	68.4	90.9
10	75.0	44.3	59.7	84.0
11	60 0	28.8	44.5	66.2
12	44.5	31.1	37.8	55.6

HUMIDITY

Mean daily relative humidity calculated from hourly observations reveals that December has a humidity of 89 percent and May the minimum 71 percent. From October to March the humidity percentage is high and from May to July it is low.

The high humidity in July and August combined with high temperature is responsible for the discomfort felt in these months. If there are no rains, the weather in Srinagar becomes muggy and unwholesome during these two months and temperature in Srinagar may rise to over 90°F in the shade.

WINDS

Winds are generally from the south and the south-east. The frequency of thunderstorms is practically nil. The direction of upper winds up to 1828.8 m is from the north-west at a speed of about 24 km per hour.

PRESSURE

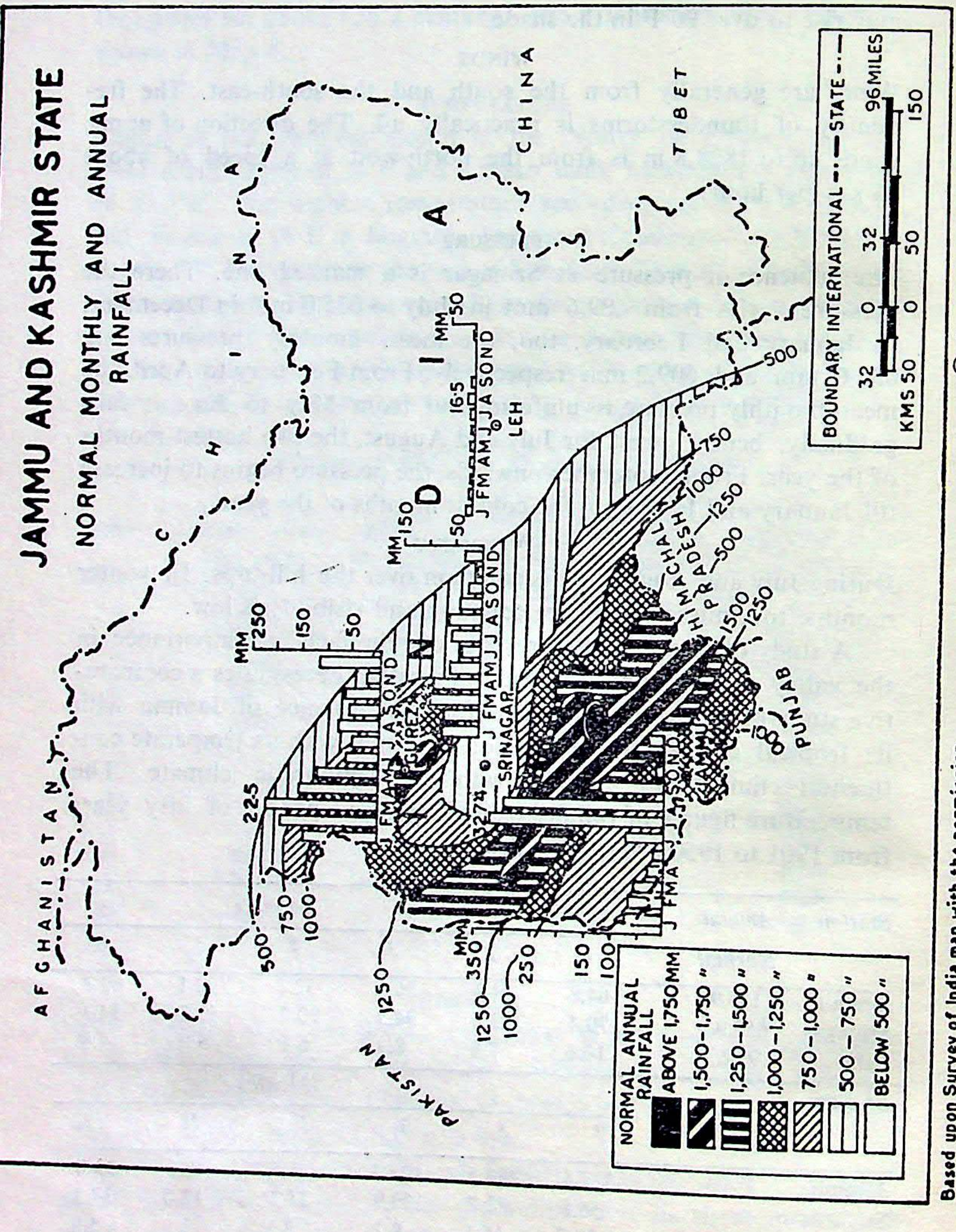
The influence of pressure at Srinagar is a marked one. There the pressure varies from 609.6 mm in July to 635.0 mm in December. In January and February, too, the mean monthly pressures are 635.6 mm and 609.2 mm respectively. From February to April, the mean monthly pressure is uniform, but from May to June it fails gradually, being lowest for July and August, the two hottest months of the year. From September onwards, the pressure begins to increase till January and February, the coldest months of the year.

VISIBILITY

During July and August fog is common over the hill-tops. In winter months, too, mist and fog are common and visibility is low.

A study of microclimates reveals certain facts of importance in the valley of Kashmir. This study of weather necessitates a comparative study of meteorological data for the province of Jammu with its tropical climate, the valley of Kashmir with its temperate continental climate and Ladakh with its semi-arctic climate. The temperature figures of rainfall extending over a period of fifty years from 1901 to 1950 are given below:

Station	*Annual Normal*	*Months*											
		1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*
Jammu	1,115.9	64.8	64.3	56.4	32.3	23.1	69.3	327.4	299.5	123.7	1.5	6.6	33.0
Srinagar	658.9	70.4	73.7	94.2	90.2	59.7	34.3	56.1	62.7	39.9	27.7	12.0	37.3
Leh	92.6	10.6	7.6	8.9	6 1	5.9	4.8	12.7	16.5	9.1	3.1	1.8	5.8



Map 4

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LADAKH

The climate ef Ladakh is of an extreme type. In summer there is burning heat during the day and piercing cold during the night. Rainfall is exceedingly low only 76.2 mm in a year. Dryness of air parches every thing and snowfall is heavy. Wild assess, antelopes, yaks, ibex and wild sheep alone can live in such severe weather. Though Leh, the capital town has no snow yet the temperature falls below —40 degrees centigrade at night. The river Indus wears a cap of thick ice in winter and jeeps pass on it. The temperature and rainfall of Leh is given below:

LEH

Months	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*
Rainfall in cms.	1.06	7.6	·89	.61	.59	.48	1.27	1.65	.91	·31	.18	.58
									Total			9.31

Thus it has been seen that climatic variation is characteristic of the territories forming the State from the Alpine (Ladakh region to the subtropical Jammu Region) with extreme variations of climate in Kashmir region owing to its location and topography. The sheltered valley of Kashmir, however, exhibits an exception to its surrounding region as already explained.

Chapter V

SOIL

DISTRIBUTION

The territories of the State of Jammu and Kashmir form a transitional climatic region between the wet monsoon of the Jammu plain near the Punjab and the dry arid Tibet. It is within this climatic variation that soils have been formed as a result of geomorphic and geolithological processes. The immature soils are encountered as the altitude rises on the mountain slopes where low temperature causes slow weathering and a shorter growing season reducing the scope of physico-chemical and biological processes. Higher up the soil cover becomes thinner till Alpine pastures appear. Under the prevailing conditions thick soil covers are confined only to valley bottoms and terraces, elsewhere only the veneer of calcareous and arenaceous covers are observed. Most of the areas of crystalline basement have either stony soils or rocky expanses.

OUTER PLAIN

The Outer plain consists of a fringe of level land a continuation of the Punjab plain extending over 240 km from Gurdaspur District, 3,657.6 m above sea level. Known locally as *Kandi* with the river Chenab flowing through it and draining parts of Basoli, Kathua till Madhopur, the southern boundary of the State, is reached. The Tawi, Manawar Tawi, Basantar and Ujh are the main waterways overflowing their banks in summer monsoon and laying thick boulders, stones and grits. The normal annual precipitation is 90 mm and the summer (June) temperature above 110°F with a fall in temperature to 32°F in winter (January).

In the sub-tropical zone high temperature mitigates the building up of organic matter in the soil. Both the organic and the nitrogenous content is low. Since heat disintegrates organic matter and heavy monsoon rain bleaches mineralised nitrogen it leaves the soil poor for cultivation. Green manuring crops like sanhemp, guara, daincha are being culivated. Adequate farmyard manure is of help when green manuring is not possible. In recent years nitrogenous fertilizers have been profitably used. Recent analysis of soil samples have shown very little clay content but a high content of magnesia.

OUTER HILLS

In the Outer Hills, known as the Siwalik Range lying between the river Ravi on the east and the river Chenab on the west, a height of about 6096 m above sea level is reached. The narrow parallel ridges of mountains separate these hills from the Middle Mountain Region. Thickly wooded to the east and drained by the river Tawi and the river Manawar Tawi the underlying rocks are loose boulders, and gravel with ferruginous clay. This type of soil spreads over the districts of Kathua, Samba, Jammu, Akhnur and Rajauri. Poor in lime and clay content these soils are treated with chemical fertilizers to increase their pH content. In this zone the problem is to fix nitrogen by growing industrial plants. Hot climate and torrential monsoon rainfall affects the soil for which measures need be taken on a planned basis.

Sub-zone	*Range in percentage Organic matter*	*Nitrogen*	*Lbs to an Acre*	
			Furrow O.M.	*Slice Nitrogen*
Jammu Kandi	0.2-0.5	0.01-0.05	2000-10000	200-1000

MIDDLE MOUNTAINS

In the Middle Mountains the Panjal range rises to a height of 457.2 m. Cut by deep ravines the mountain ridges branch off in irregular directions till the Panjal range enclosing the valley of Kashmir is reached. The Pir Panjal looks over the valley of Kashmir. The districts of Udhampur, Doda and Punch cover this region where annual precipitation ranges from 1,015.99 mm to 1,777.99 mm within an average altitude of 762.0 m. There are many valleys of which the valley of Bhadrwah and Kishtwar may be mentioned for its valuable vegetation. The soil bed is thick to support the Himalayan oak, pine, spruce, fir and deodar. Decayed vegetation provides nitrogenous material on lower elevations. Towards lower elevations the soil bed becomes thinner and thinner till the rocky bed of gorges and ravines appear.

KASHMIR VALLEY

In the Kashmir valley there is sufficient organic matter and nitrogen content in its alluvium. Plant residue, crop stubbles, natural vegetation and animal excretory products enrich the soil.

The valley of Kashmir is included in the Temperate zone along with Doda and Punch districts for their geographical similarity. With a distinct variation in temperature and precipitation within an elevation of 1,524.0 m to 1,850.0 m normal annual precipitation is 62.4 mm. Annual temperature seldom touches 100°F and minimum in winter is not, usually below 20°F. Occasionally as in 1958-59, it may go down to 10°F freezing the water of the Dal Lak to a depth of 0.3048 m.

Mechanical analysis of soil began first and the result is given in the following table :

Mechanical analysis of soil in percentages

Place 1	*Coarse Sand* 2	*Fine Sand* 3	*Silt* 4	*Clay* 5	*Taxtural class* 6
		1. Cold dry arid zone			
Leh (Ladakh)	4.17	84.83	2.5	8.5	Loamy Fine Sand
		2. Kashmir Temperate			
Khrew	0.73	17.27	40.4	41.6	Loamy clay
		3. Kashmir Temperate			
Ganderbal	3.71	30.22	30.4	35.6	Loamy clay
Sopore	0.280	15.32	54.40	30.0	Silt clay
Anantnag	0.050	17.15	44.800	40.0	Silt clay
Srinagar (Brane)	0.70	60.70	20.4	18.2	Clay loams

(*Contd.*)

1	2	3	4	5	6
		4. Jammu Temperate			
Kisthwar	10.70	19.04	22.0	48.00	Heavy clay
Ramban	12.23	19.75	20.00	50.00	Heavy clay
Udhampur	34.60	37.80	8.40	18.0	Sandy clay loam
Jammu	23.870	56.790	17.51	1.90	Coarse sandy loam
Samba	21.79	60.01	8.4	9.8	Fine sandy loam

The soils vary from clay loam to loam. The nitrogen content is higher than in other regions of the State but more conspicuous in the cultivated lands bordering the forests. Phosphorous pentoxide and potash contents of the soil are high throughout the valley and there is also a good proportion of Calcium and Magnesium. Alluvium in the the lower level of the valley is renewed by floods and snow and ice action also occur.

The Karewas occupy more than 85,469.17 sq km of the area of the valley out of a total of 22,166 sq km. Both the organic matter and nitrogen content is low in Karewa soils. Natural vegetation is very poor and crop growth, wherever possible, denudes soil of its richness. Pulses and oil seeds when cultivated on the Karewas provide nitrogen content to the soil but precipitation leaves these lacustrine mounds poor after being drained by rain. Soil nutrients near the lower slope of the Karewas contain organic matter. It has been calculated from 8,000 lbs to 36,000 lbs per acre furrow slice. According to nitrogen content the Karewas soils are termed "poor status".

CHEMICAL ANALYSIS

In recent years a study of productive potential of soils in the State of Jammu and Kashmir has been taken up in laboratories. Chemical analysis of soil samples upto a depth of 0.1751 m to 0.3048 m has revealed the textural composition in various physico-climatic zones of the State.

Silica gives weathering resistant materials to soil. Advanced studies in soil genesis when taken up may reveal many useful facts but soil chemists believe that silica content is in higher percentage in sub-tropical Jammu and cold dry Ladakh. In the temperate zone of the

Soil : Chemical Analysis of Kashmir Valley and Ladakh

	Kralpora	*Pampur*	*Sumbal*	*Sopore*	*Ganderbal*	*Ladakh*
% Loss on ignition	11.30	11.25	7.84	8.70	16.10	5.35
% Acid insoluble residue	77.58	70.70	80.48	84.21	65.05	88.00
% sesqui-oxide	9.00	13.875	9.37	7.37	7.75	3.900
% Fe	2.92	4.40	5.16	3.44	2.24	0.80
% Al_2O_3+ T_1O_2	6.08	9.475	4.21	3.93	5 51	2.885
% CaO	0 266	3 65	1.47	0.31	7.07	1.673
%MgO	0.495	0.061	0.56	0.495	4.72	0.0452
% Phosphorous P_2O_5						
Total	0.1453	0.1694	0.265	0.123	0.1232	0.115
Available	0.03708	0.0229	0.014	0.027	0.0292	0 0321
% Potash (K_2O)						
Total	0 4364	0.9275	0.402	0.027	0.3675	0.287
Available	0.0747	0.0560	0.010	0.071	0 0606	0 049
% Nitrogen	0.112	0.308	0.120	0.112	0.168	0 049
% Carbon	7.00	0.24	1.32	1.14	1.05	
% Organic matter	1.393	0.414	2.27	1.953	1.81	
pH	7.2	8.8	8.9		8.3	7.00

Kashmir province the silica percentage is low. Sesquioxides show lower percentage in subtropical and cool dry temperate zone. On the other hand organic matter is higher in the temperate zone than in dry cold and subtropical zone. Cold dry weather and lack of leaching because of low precipitation resulted in accumulation of bases in the surface soil and the pH value is high. Organic manuring through night soil and cultivating of green manuring crops like alfalfa will disintegrate and produce neutralising effects on bases. Such results have been seen in Leh. Soil treatment is ultimately a question of adjustment between various constituents of fertilizers.

The Karewa soils are very poor in potassium. Farmyard manure alone can help even better than potassic fertilizer. Fruit trees get their subsistence from subsoil as seen in Damodhar Karewa where fruit trees grow without any potash deficiency.

PHOSPHOROUS

Phosphate minerals occur in veins and intrusions of igneous rocks. Plants draw phosphorous from the soil while in growth. Human beings return phosphorous through excreta, decayed bones and parts of animal body. Fat and albumen formation is possible with phosphorous. Root and bulb crops like potatoes, beets, raddish, carrots and onions need phosphorous for growth.

In the Jammu area phosphorous content is low as it gets dissolved in rain water and flows away. Application of phosphactic fertilizers is necessary. The legumes will bring up phosophorous from subsoil and deposit it in the surface for the use of crops.

In Kashmir Valley at lower level phosphorous content is fairly good ranging from 0.1 per cent to 0.3 per cent, or from 2000 lbs to 600 lbs per acre furrow slice. There is very little need of phosphorous fertilizers for the land. The Karewa soils alone need phosophorous treatment as already explained.

ORGANIC MATTER AND NITROGEN

Organic matter, carries nitrogen. Leguminous crops like peas, beans, phaeseolus (*moong*), horsegram (*mash*), gram, clovers, guava and daincha provide nitrogen. Nitrogen is needed for plant metabolism. High nitrogen content is needed for crops where vegetative growth is needed. Calcium and magnesium provide mineral nutrients to plants. Acidity caused by removal of bases and substitution of hydrogen is low. Alkalinity is caused by accumulation of bases. Too much precipitation carries away soluble salts, like those of Calcium and Magnesium.

HORTICULTURE

Horticulture is an important agricultural sector covering an area of more than 75,000 acres of land. Fruit cultivation is spreading fast and plant protection schemes along with marketing and planning have been introduced. The quantity of fruit available for export is expected to reach 3.50 lakh tonnes by the end of 1980. Soil surveys in orchards form a part of pedological research for various kind of fruits, the nitrogen requirement of which is given on next page:

Nitrogen Requirement for Fruits

Kind of Fruit	*Prior to bearing*	*Moderate Yield*	*High Yield*
	Nitrogen in Lbs per acre		
Apples	8-24	70	132
Pears	9-24	52	110
Plums	10-35	79	140
Peaches	12-52	96	184
Cherries	10-26	61	123

KASHMIR SOILS

For crop utilization in the valley of Kashmir a study of soil appears to have begun from early times. The references in the *Nilamatpurana* and the *Rajtrangini* confirm this. If not on a scientific bases, at least in a spirit of enquiry, farmers have differentiated between agricultural operations and known something definite about the physico-chemical and textural nature of soil, as revealed by a critical study of *Krishi-Sukta*. Experimentation of some sort to determine the reaction of soil when treated with different manures must have been practised throughout the centuries as the entire field of agricultural operations appears to have been dynamic in character.

The formation of soils in the valley of Kashmir is the result of climatic factors. These processes compare favourably with the cold temperate regions of Europe and differ from the tropical and sub-tropical. Low temperature from December to March causes low weathering and shorter growing season reduces the extent of physico-chemical and biological processes. The temperature and soil-water relationship as influenced by prevailing relief predominently affects the nature and density of vegetation. Since nature has its own cure for every calamity, grass grows freely on higher elevations, protecting soil from erosion.

The oval valley of Kashmir at an elevation of about 1,524.0 m above sea level and surrounded by the mountains rising up to 4,267.2 m above sea level, has its own pedological peculiarities. Towards higher elevations the soil-bed becomes thinner till the Alpine glades are reached which remain clothed with snow and ice for more than seven months. The marked feature of the valley, which is the bottom of a dried up lake is its shelving shores of lacustrine deposits known as the *Karewas*. This gives a clear demarcation between the two broad types of soil in the valley. The new alluvium found in the bays and deltas is above the bank of the Jhelum river and extending up on the undulating *Karewas*. This alluvium is renewed almost every year adding to the fertility of its soil as a result of floods and silt brought down by mountain streams. The common types of soil peculiar to the valley and known from very early times are the following:—

The Glacial Soils

There is geological evidence to the effect that the characteristic glacial topography is found to the northern and north western region of of the valley above 1828.8 m contour. This region is under snow and ice for more than seven months. The morainic material is found scattered to the north-west of the valley of Kashmir.

The Gurti

This type of soil owes its origin to floods in the valley of Kashmir. This silt is rich in clay and contains moisture. It also stands to scanty rainfall, a characteristic for which it is prized by the farmers. The Jhelum river and its tributaries swell up and overflow the banks. The volume of water that can be safely carried in the river between the banks is more than one half of the volume of the high flood water. The other half of the discharge flows into the valley by over dropping and breeching the bunds. It is the favourable topography of the valley with its gradient to the centre towards the Jhelum river that enables the whole of the flood water to come back into the river. Thus is the silt spread over the land increasing its fertility. The river banks being generally higher than the land behind them, the main stream and its tributaries flow between high and well defined banks from Shopyan to Baramulla. Coarse sand, however, predominates

Site	*Mean diameter in mm*
Jhelum (Sangham)	1.0270
Jhelum (Rampur)	0.225
Jhelum (Weir-Srinagar)	0.1954
Vishav (Tributary)	0.4486
Rambiara (Tributary)	0.3392

below Sangam and the dead material is of a very coarse order of 1000 mm diameter. Investigations have revealed the silt index of the Jhelum river and its tributaries above the Wular lake as shown in table on page 63.

Behil

The much prized kind of soil is known as Behil for its natural strength. The only precaution is the need of extra caution in applying manures because any addition beyond optimum will make the plant run to leaf. In case of paddy such a kind of calamity is called *Rai.* Centuries of experience, however, taught the farmer to press the soil between fingers and smell it to determine its strength of nutrients and the dosage of manure required.

Sekil

It is an important type of soil from light loam to sandy subsoil which when properly irrigated gives a fair yield of paddy. This kind of soil is found to the north-west of the valley where the Sind river flows over its sandy bed.

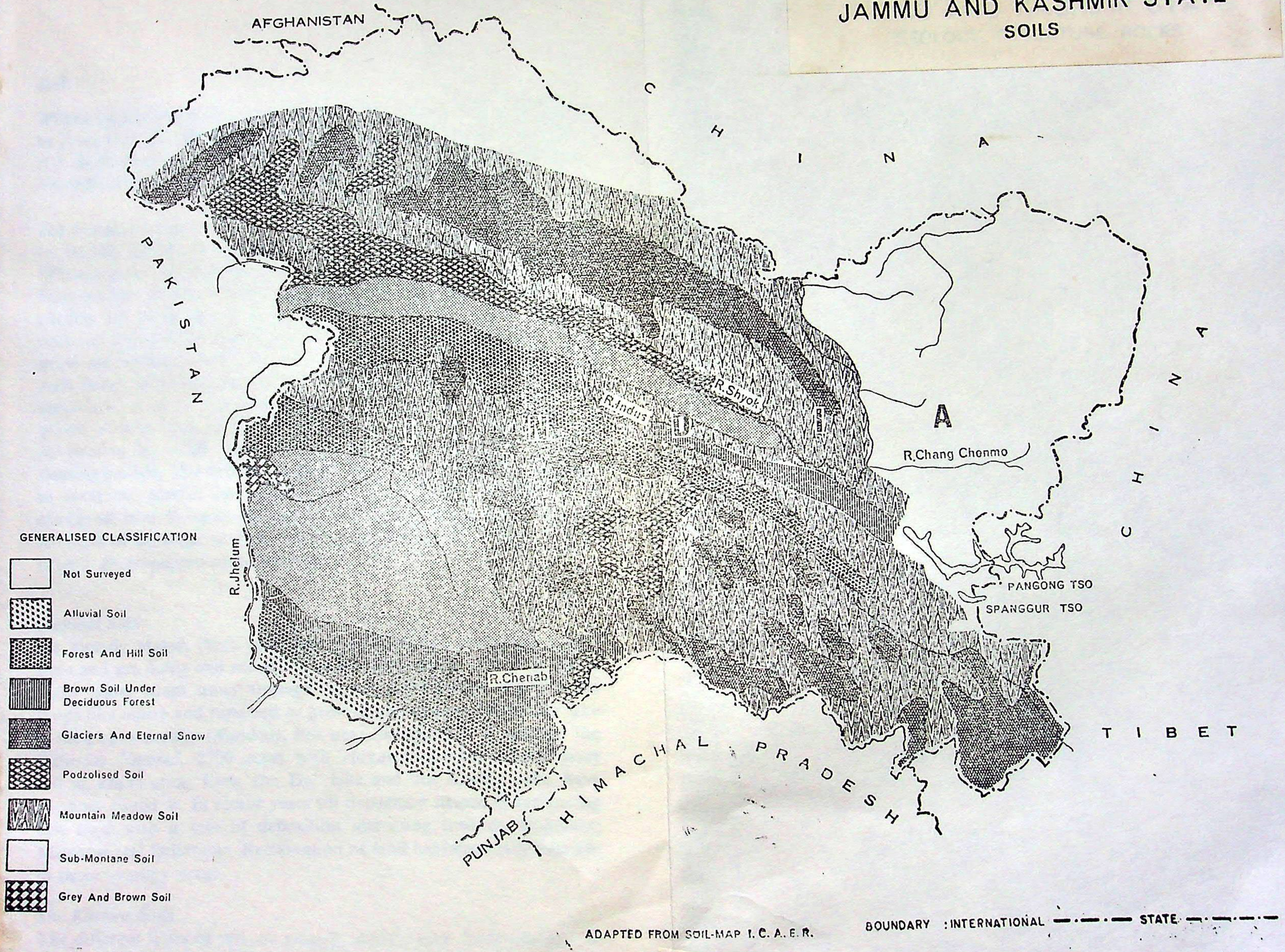
Surzamin

For the growth of vegetables *surzamin* is suitable. The vegetable growers, known as *ārms*, used to roam at dawn through the city collecting nightsoil besides manuring stuffs which are mixed with soil to help the growth of nursery plants. It is then that these small plots are watered by the dipwell method and the dark ashy coloured soil-bed with its obnoxious smell is converted into a green garden of saplings. These vegetable gardens are spread along the waterways but percolation from irrigation has begun to spoil these plots of land. The nearness of water table makes soil unfit for deep ploughing. Such areas are known as *Khār—Zamin*—a kind of soil sour to taste.

Lemb

Lemb is generally land in which springs occur. It is a kind of hard stiff clay which always cakes when dry. To a visitor moving in a small boat through the waterways of the city of Srinagar and its environs the sight of building land by filling lake with mud and weeds inbetween the willow cultivation in shallow water will be seen.

JAMMU AND KASHMIR STATE
SOILS



Based upon survey of India map with the permission of the Surveyor General of India.

Map 5

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Willow cultivation in water pre-supposes an addition of new land even by revenue authorities who term it as *Demb*, a raised land of not hard soil. Since the ambitious owner wants to create land within the willows before these are cut his efforts help to extend cultivation.

The Floating Gardens

In the Dal lake there are gardens which float. These resemble the "Chinampos" of Old Mexico. These floating gardens vary in length from six feet onwards. The floating gardens are moored at the four corners by poles driven into the lake bed. There is neither parent rock nor any soil bed but sheets of haphazard amalgam of clay and grass woven into a bed. The *Poker* is a cone placed in the *Rādh* and each *Poker* accommodates at least two seedlings or watermelon or cucumber. It is in the *Rādh* that everything is present to enrich the plants. A kind of grass known as *Pych*, used for making mats is also for making the *Rādh*. Its roots are intertwined to make a hardy floating garden. The circular mass of these roots are simply planned to form the garden bed. Every year the stratum of the garden is examined, from below to check it from becoming rotten and to ensure the yield of cabbage, turnips, carrots, raddish, water-melon, musk, brinjal, green-pepper and *Knol-Khol*.

Nambal Soil

As already stated there are many peaty swamps containing a little lime and are fiable and suited for paddy cultivation. The soil being leaky water seeps away through the sub-soil allowing only dryland crops like maize and rapeseed to grow in abundance. The Wular lake is the largest swamp (*Nambal*). Just near Srinagar is a swamp, the Batmalu *Nambal*, 2700 acres with Hokarsar another swamp about 7.6 sq. km in area. Even the Dal lake and the Anchar lake have swamps round it. In recent years silt deposition helped in reclaiming this land with a rate of deposition increasing towards Hokarsar, Mirgund and Sultanpur. Reclamation of land has been easily possible in these swampy areas.

The Karewa Soils

The different types of soil, as already stated, vary from altitude to altitude but the soils of the Karewas have peculiarities of their own in the valley of Kashmir. These fan-like projections protrude, from the surrounding mountains mostly to the west with flat arid tops, a unique morphological feature peculiar to the valley of Kashmir. The Karewas are spread from Shopyan to Baramulla, a distance of about 120 km on the south western side of the valley.

To the south west the soils of the Karewas are loam and loamy clay. To the south east the soil is rather coarse drab or brown sand with hardness increasing with the depth. The Indian Council of Argicultural Research has advocated a new method of deep-tractor ploughing after rainfall to enable soil nutrients to come up on the surface. In view of floods in spring and autumn which extends up to 30°48′ North to 32°17′ North Latitude and 73°26′ East Longitude to 80°30′ East Longitude the cultivation has to be extended vertically.

A sample study of some of the soil types at various altitudes has revealed a change in colour due to the amount of organic content. At higher elevations the soils are heavy textured and fairly strong to resist leaching. The calcium (Ca) and magnesium (Mg) content is fairly high. Processes of weathering, decomposition and renewal of silt by floods appears a cooperative process of advantage by the forces of nature. Many suggestions have been made regarding the disintegration of soils nutrients which can be claimed for cultivation if organic residue from night-soil and green manuring is practised. The growing of alfalfa grass in also suggested. There are many alkaline areas in which acidic fertilizers can be of help and vice versa. In Badgam where the cultivation of beans and peas and other leguminous crops is spreading fast a new method of drying the leguminous crops and then after powdering are beaten back into the soil bed.

Alkaline soil predominates in some of the areas of Jammu toward Bishnah where a rich alkaline soil bed is found with which one could wash clothes. A specimen of this kind of soil when examined revealed 31 percent alkalinity.

In recent years cultivation of commercial seeds and fruits like apples, pears, plums, almonds and walnut has spread. The rise in prices and assistance by the State Department of Argiculture has helped in a mushroom growth of small scale orchards and seed farms since no particular soil is required for this type of cultivation. In this respect there appears a slow method of annexation by horticulture over agriculture. The experimental orchards have shown that the soil profile should have rich chemical nutrients except in those areas where soil has impenetrable layers of hard pans.

Nutrients in the upper layer with water table is at least six feet below the level of ground. The horticulturists, it is gratifying to observe, have some awareness of the complex problems of research, micro-climates, variation in soil nutrients, knowledge of insects and the use of acids and alkalis.

Research in soil is essential but it is to be correlated with the agricultural practices in vogue at all elevations in the territories of Jammu, Kashmir, Gilgit and Ladakh. The local terminology, sympathetic understanding of the farmers in the age old agricultural operations and a scientific appreciation of the adages is to be consolidated in a view to impart to it a research bias based on the practical knowledge of modern pedological science to keep abreast of ever increasing knowledge in the science of soils.

RECENT SOIL SURVEYS

In her soil map Z.J. Schokalasaya mentions the "soils of the vertical zone of the Himalayas as comprising most diversified soils varying from mountain—meadow soils to Zheltozems (yellow soil) and Kransozems (red soils) supporting the evergreen forests of the Eastern Himalayas."[1] The terrtories of Jammu and Kashmir State do not fall within the aforesaid forest zones.

Only the Outer plain of the Jammu Province, the tropical and sub-tropical dry older alluvium and hard rock is touched by the fringe of the map prepared by this eminent Russian pedologist.

However, in the generalized soil study of India prepared in the year 1935 by Wadia, Krishnan and Mukerjee[2] various soil types with emphasis on the parent rocks were examined and synoptic pedalogical information made available for the first time. Even though critics declare it as a work of very little practical value in applied techniques yet its broad and essentially scientific basis could not be underrated.

INKLINGS IN PEDOLOGICAL RESEARCH

The well organised Department of Forestry in the State of Jammu and Kashmir attempted a field study in soils of Kashmir. It was an elementary attempt as assessing the soil potential for forest utilization. Many reports were prepared, some of which are of reasonable standard for study as the tradition of keeping notes on soil in a broad outline seems to have been maintained at times. It is from these scattered notes here and there that use has been made of some field observations by writers from time to time.[1]

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[1] Schokalasaya, *The Natural Conditions of soil Formation in India,*" pp. 149-51.

[2] *Record*, Geological Survey of India, Volume LXVIII, Part 4, Calcutta.

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[1] Statistical Digest (Forestry), Jammu and Kashmir State, 1949.

Chapter VI

VEGETATION AND FORESTS

As rising in its purple wing,
The Insect queen of eastern spring,
Over emerald meadows of Kashmir,
Invites the young pursuer near,
And leads him on from flower to flower.

Byron

The State of Jammu and Kashmir is endowed with a wide variety of climatic and altitudinal conditions ranging from the semi-arid undulating plains of the Himalayan foothills in the Jammu region to the lofty snow-capped mountains of the Inrer Himalayas in Kashmir, Ladakh and Gilgit. As a result the flora o: Jammu and Kashmir is rich and varied. Much work has been done on the quantitative distribution of the floral wealth of the State and is appropriately described in the relevant literature. An attempt is made in this chapter to outline the importance of economic flora of the State.

The semi-arid plains of the southern boundary of the State merge into the plains of the Punjab. These regions are hot in summer and are inundated by numerous ravines caused by the south-west monsoon and continuous erosion by indiscriminate extermination of the scrub flora comprising Acacin species Toona, Grewia and the like. *Artemisia scoparie*, Vcasica species, *Carthanes oxycantha*, *Sacchagum munja* and *Paeonria litter* the ravines. In the more fertile patches, however, mango (*Mangifera indica*) and *Shisham* (*Dalhergia sisson*) are fairly well distributed. Some aquatic plants like *Segi harica*, *quayanrsis*, *limman-themium cristatione*, flourish in the tiny lakes formed by accumulation of rainwater in eroded depressions.

Flora of the lower Siwaliks in the Jammu region consists largely of *indigofera Adhtoda*, *Dodanacea*, *neruima*, *zizphus* and *Acacia modesta* with a sparkling of pine trees (Pinus roxburapi) at the higher altitudes.

The higher regions extending from Udhampur through Ramban, Doda, Kishtwar and Bhadrwah to Punch receive good rain and snow in the higher regions and are, therefore, rich in vegetation. Kud, Batote, Sanasan, Bhadrwah and Kishtwar are particularly rich in chir and deodar forests and the shrubby *Barberis, spiraea, Primsepia Quercus*, and *ilex* adorn the gentle slope of the mountain spurs.

Conifers dominate the Chenab valley mountains and the lower regions around in *olea artemesia* and *polygala. Cedrus deodara* and *pinus excelsa* grow profusely in Kishtwar mountains. *Armi* a well known fungus infection causes considerable damage to *pinus excelsa* and needs to be eradicated.

The Pir Panjal range of mountains extending over an area of about 1,400 sq. kms form the southern boundary of the valley of Kashmir. Vegetation of this region is very different from the deciduous and mixed type of plant growth of the outer plain of Jammu or the temperate vegetation in the valley of Kashmir. *Pinus excelsa, picea, morinda* and *cedrus deodara* constitute the dominant flora of the Pir Panjal with an herbaceous under-growth. *Podophyllum, Rubus* and *Trillium* are found with rich nutritive grass and sub-Alpine herbs of various colours on the lower slopes. These Alpine meadows are of economic importance and provide grass to the migratory livestock of *bakerwals* and Gujjars who move across the mountains during spring and autumn each year.

Jammu Province has 46 per cent of its total area under forests varying from 23 per cent in Kathna, 42 per cent in Punch, 44 per cent in Jammu, 50 per cent in Doda to 53 per cent in Udhampur.

In the Kashmir province, however, forests occupy 58.4 per cent of the total area and in the district of Baramulla and Anantnag this precentage is as high as 70 per cent and 60 per cent respectively. In the entire State conifers account for as much as 85 per cent of the total forests.

On the southern slopes of Pir Panjal which receive the monsoon rains, vegetation is relatively scant, whereas the northern slopes bordering the valley of Kashmir are covered by rich and thick conferous forests. In the Ladakh region vegetation is very sparse except for a few scattered grassy patches and stunted cidars and willows in the moist strips. Ladakh is almost devoid of vegetation.

The Kashmir valley with its beautiful water resources has an abundance of willows and poplar, commercial fir, deodar and kail grow well and dense on the surrounding mountain slopes.

FORESTS

Man cannot get along without timber. Timber has played an important part in all stages of civilization. In Kashmir because of cold winter "fire-pot" is even more essential than the "food-pot." It is of importance as fuel in the form of charcoal. The migratory population, the settled agriculturists, the industrial settlements and the rural and urban centres need wood in increasing quantities.

Forests play a vital role in the economy of the State of Jammu and Kashmir. Ladakh is devoid of vegetation and its contribution to the forest resources is negligible. The following table lists briefly revenue receipts.

Annual Revenue From Forests

Year	*Revenue in crores of rupees*
1966-67	4.07
1968-69	4.35
1969-70	5.20

DISTRIBUTION

The province of Jammu is rich in chir and deodar. The province of Kashmir contributes fir and *Kail*. The four districts of Doda, Udhampur, Baramulla and Anantnag have rich forests forming 55 per ccnt in fir and spruce, 22 per cent deodar, 18 per cent Kail and 5 per cent of Chir. The total area of 21,236 km accounts for 10,139.75 km in the Jammu Province and 11,095 km in Kashmir province. Only 0.75 km are under forests in Ladakh even though the district constitutes as much as 70 per cent of the total area of the State.

However, an encouraging trend of growing more trees has been showing positive results in recent years. Over ten lakh trees have been planted so far in Leh, Kargil, Muhra and Zanskar ranges. Sandy soil and very low rainfall stands in the way of soil forming processes in Ladakh.

There is another category of forests besides fir, kail, deodar and *chir* which contributes to the States exchequer. These are the *Rakhs* preserved for game and cultivation of firewood. The distribution of the categories is given below :

Classification of Forests in Jammu and Kashmir

	Total area	*Regular Forests in sq. km*	*Rakhs*
Jammu and Kashmir	128,592 sq. km	18914	595.7 sq. km

The district-wise distribution is as under :

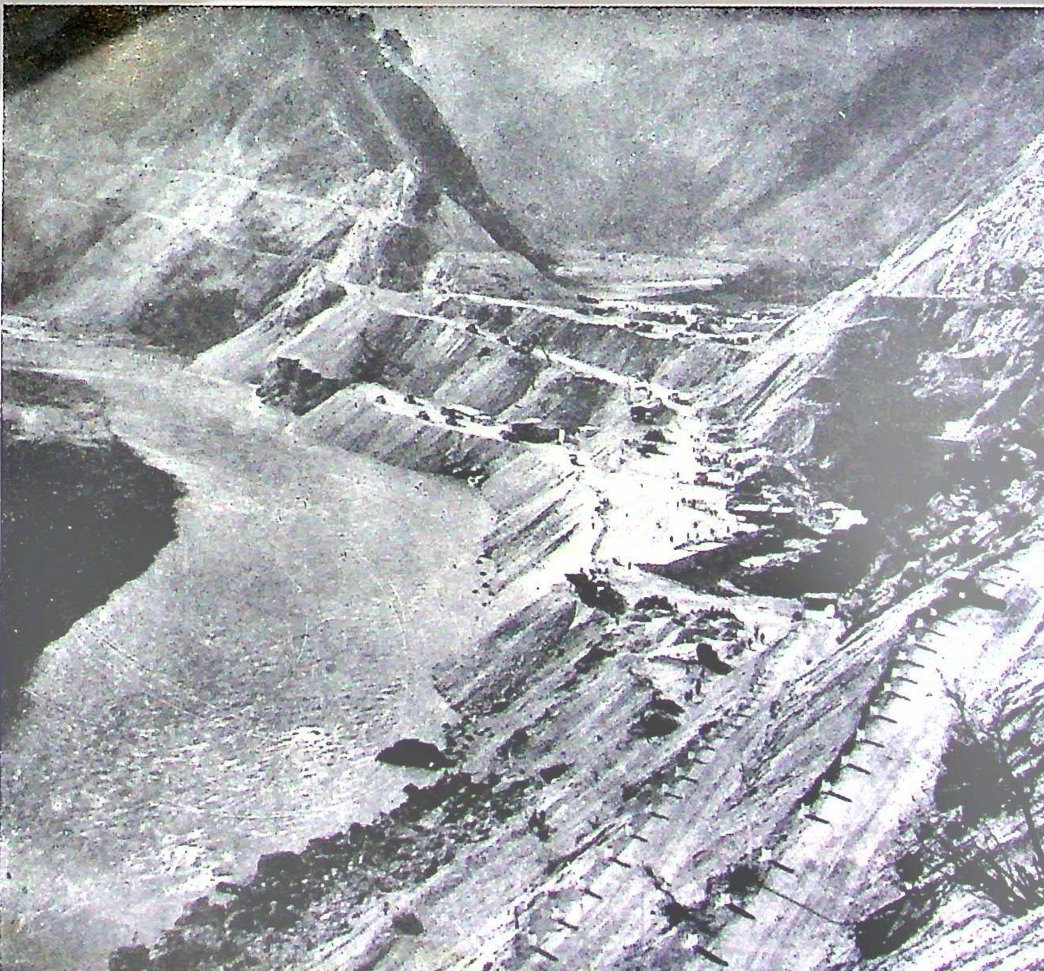
District	*Total area (sq. km)*	*Forests area (sq. km)*	*Regular Forest (sq. km)*	*Rakhs (sq. km)*	*Percentage of forest area to total area*
Kathua	2651.2	629.37	613.83	15.54	24
Jammu	3233.8	1427.09	1388.24	38.85	44
Udhampur	4384.9	2559.49	2328.41	31.08	53
Doda	7940.8	5723.90	5723.90	N.T.	50
Anantnag	5430.9	3263.40	3105.41	167.99	60
Srinagar	3421.2	919.45	616.42	458.43	29
Baramulla	6568.2	4659.41	4723.15	36.26	71

Since movement of timber is possible largely through rivers mention may be made of the Ravi and the Chenab and their tributaries in the province of Jammu and the river Jhelum and its tributaries particularly the river Sindh and the river Krishenganga in the province of Kashmir. These provide cheap transport for timber floated in the form of sleepers and logs from forests to the markets in towns and cities.

Areas under main types of forests is given below :

Type of Forest	*Area in sq. km*
1. Coniferous	7448.84
2. Temperate broadleaved	124.84
3. Thorn Scrub	158.25
4. Bamboo	15.80

Banihal Cart Road



Leh market a view

FOREST ECONOMICS

Out of the 22,797.41 sq km about 5180.0 sq km are available for the exploitation of timber and the remaining about 17,617 sq km are covered with uneconomic forests. A rich variety of spruce, pine and deodar trees grow and present a towering appearance adding scenic interest for the tourist to this source of commercial importance. Besides, water flow is regulated and it helps in preservation of soil which receives sufficient humus and, therefore, a rich nourishment of nitrogen.

Timber for construction, fuel wood for domestic use and grazing grounds for livestock, cattle in lower level and sheep and goats at higher altitude are the natural advantages of forests besides herbs and plants utilized for the manufacture of drugs in the State.

In recent years a number of 'Working Plans' for reorganising fast utilisation and management have been raised from three in 1964 to nine in 1974. These working plans are now on at Udhampur, Doda, Rajauri, Ramban, Billawar, Kishtwar, Kamraj, Langet and Pir Panjal.

Soil conservation has received increasing attention over the recent years. New methods have been introduced for planting and reorganising farms. From the beginning of the plan period forests of the State have received assistance for development as shown in the following table:

in lakhs of rupees

Five year Plan	*I*	*II*	*III*
	14.70	75.30	126.26

Soil conservation has improved and some new schemes are in progress.

Soil Conservation

	1964-65	1965-66	1966-67	1967-68
Acres	14,045	13,962	13,565	16,000

With a view to nationalise the forests by the State Government a lumbering project has been established. In the year 1970-71 about 15 lakhs cubic feet of timber were extracted and this was about 7 lakhs cubic feet more than the year 1969-70. During the first three plans an extensive programme of planting trees was followed over an area of 25,000 acres excluding the districts of Doda and Punch at a cost of Rs. 130.18 lakhs. The province-wise distribution is given in the following table:

Number of Plantations

Year	*Jammu Province*	*Kashmir Province*
1967-68	46,768	248,962
1968-69	37,052	435,879
1969-70	39,639	12,225

The approved plan outlay for 1970-71 was Rs.40.00 lakhs and for soil conservation another Rs. 40.00 lakhs. For the year 1971-72 the figures was Rs. 48.15 lakhs.

Plan outlay in lakhs (rupees)

Year	*Forest Development*	*Soil Conservation*
1970-71	40.00	40.00
1971-72	48.15	37.50

More than 10 lakh maunds of fire wood are required for supply to the people. As the demand is at an increase about 10,644 hectares of land are being subjected to intensive plantation.

Timber for small and big industries is possible in Kashmir where poplars, walnut and mulberry trees are planted and *sheesham* trees in Jammu province. Besides *sheesham*, *sajal* and bamboo plantation has covered an area of 10,025 hectares. Only the mulberry tree is a reserved one as it provides raw leaves to sericulture and its timber for sports material. The need for the establishment of nurseries receives attention and the details of plantation in these nurseries for various years is as under.

Year	*No. in lakhs*
1969-70	29.70
1973-74	36.50
1976-77	50.00

A campaign against the exploitation of forests is on paper and it is to be seen how far forest traders and middlemen may be discarded for making undue profit.

Survey work is going on in forests for the opening of roads and construction work is stated to be going on for widening the existing roads and opening of new roads. An amount of Rs. 397.48 lakhs is to be spent to cover a road length of 2,190 kms by the end of the Fifth Plan period.

Targets Achieved fifth five year plan 1979

1.	Fire wood	7944
2.	Economic trees	6300
3.	Work plans	1526 Sq. miles
4.	Rehabilitation of forests	1519 hectares
5.	Construction and renovation of roads in forests	1600 kms.
6.	Forest area	20,856 sq. km

Of the important species of commercial softwood the area under various species is given in square kilometres as under:—

1976-77

Area under Forests

Commercial Softwood	*Area in sq. km*
Deodar	1,129.38
Kail	1,797.31
Fir	2,977.94
Chies	1,641.10
Total	7,545.73

DEVELOPMENT

During the Fifth Five year Plan forests have been given due importance. Such tasks cover 58.4 per cent of area of the provinces of Jammu and Kashmir. It is obvious that the desired nationalization of the forests is speedily achieved. Some of the schemes for protection and development of forests are given below:

1. Construction of a timber boom on the river Chenab at Akhnoor to check loss of timber by floating down to Pakistan.
2. Fuel wood plantation-cum-farm forestry (Willow in Kashmir Robina in Banihal, Doda and Shisham in Jammu).
3. Icononin plantation (poplars, willow, walnut, mulberry, ash in Kashmir and *shisham*, kham, simbal and camboo in Jammu).
4. Rehabilitation on degraded forests.
5. Forest Research.
6. Development of minor forest products (kuth, belladona, artemisia, dhoop, hops).
7. Forest demarcation and consolidation (fixation of boundary lines and boundary pillars).

During the Fifth Five Year Plan considerable attention has been given to open the interior of the area in forests. Many roads have already been completed during the Fifth Plan period when it was proposed to construct and upgrade about 21 per cent of the forests area. The development of forests is taken up now on *tahsil*-level. It has resulted in a thorough understanding of the local problems dealing with various projects under the Plan. The distribution of forests in Kashmir is given below:

Distribution of Kashmir Forests 1977-78

Tahsil	*Geographical area in sq. km*	*Area under Forests*
Srinagar	469.05	302.97
Badgam	1241.90	217.69
Ganderbal	1453.25	397.98
Total	3164.20	918.64
Anantnag	2688.42	1889.59
Kulgam	1570.83	592.07
Palwama	1171 72	781.43
Total	5430.97	3263 09
Sapore	2652.42	946.07
Karnah	406.63	107.28
Handwara	1588.45	1309.55
Uri	697.23	306 91
Sonawari	394.20	222.74
Baramulla		658.18
Total	6568.25	3248.11

RESEARCH

Research in forestry and its allied industries is carried on at various places in the State. There are research laboratories at Chhetarnar and Tangmarg. At Srinagar pilot projects on regeneration of fir, improvement of seeds, trials of exotics, propagation of conifers and studies in ecology of plants and animals are carried on. It is, however, necessary that public awareness for protection of this natural wealth in forests is created in the interests of the future. Since it takes a number of years for trees to grow and exert a healthy influence on climate, soil, wild game, hunting, sport, drugs and other forest based industries a list of such trees is given below:

Industries Dependent on Forests

	Yield	*Kind of Wood and Plant*	*Place*
1.	Match	Poplar	Baramulla-Kashmir
2.	Rasin Turpentine	Pine	Miransahib-Jammu
3.	Sports Goods	Willow, Poplar, Mulberry	Miransahib-Jammu
4.	Santonin	Artemesia	Baramulla-Kashmir
5.	Rifle-Halfrought	Walnut	Baramulla-Kashmir
6.	Drugs	Herbs, Medicinal Plants	Srinagar, Jammu
7.	Timber (Saw and joinery)	Deodar, *Kail*	Srinagar, Kashmir
8.	Wood Carving	Walnut, *Chinar*	Anantnag, Srinagar
9.	Truck and bus body building	Walnut, *Shisham*	Jammu

BIO-ASPECTS OF FORESTS

The valley of Kashmir is situated in the centre of Asia, like a crown on the subcontinent of India. The glory of the Himalayan spectacle of nature's bounty in scenic grandeur in beast and in bird is here.

There are many resident birds that have adopted to the local surroundings but migration suits some. Such study in the domain of ornithology is necessary to appreciate this branch of natural history to impart an awareness of environment to a geographer.

A list of some of the common birds found in Kashmir is given below:

Ornithological Distribution in Kashmir

Kashmiri Name	*Scientific Name*	*English Name*
Botin Kav	Corvus corax tibetanus	Jungle crow
Ranga Tsar	Parus major caschmirensis	Kashmir Grey Tit
Male-Kantur	Passer domesticus griseiqularis	Kashmir House Sparrow
Female Tsar		
Kola Tonch	Alcedo atthis pallasii	Central Asian Kingfisher
Tota	Psittacula krameri	Green Parakeet
Rata Mogul	Tyto alba stertens	Indian Barn Owl
Kotur	Columba palumbus	Wood Pigeon
Kakov	Alectoris graeca chukar	Chukor
Tech	Gallinula chloropous indicus	Indian Moorhen

(*Continued on next page*)

Kashmiri Name	*Scientific Name*	*English Name*
Bill-bi-chur	Molpastes leucogenys	White-checked Bulbul
Wan Kastur	Trodus rubrocanus	Grey Headed Thrush
Hazar Dastan	Myiophoeus caeruleus temminckii	Himalayan Whistling Thrush
Poshinul	Oriolus kundoo	Indian Oriole
Tsinihangur	Sturnus valgaris humii	Himalayan Starling
Katij	Hirundo rustica	Common Swallow
Satut	Upupa epops	European Hoopoe
Male-Sunal, Sund	Lophophorus impejanus	Impeyan Pheasant
Murg		Monal
Female Ham		
Kukil	Streptopelia decaocto	Ring Dove

The distribution of animals in Kashmir is given below :

English name	*Kashmiri name*	*Locality*
Poisonous snakes	Gunus	Sind Valley
	Pohru	Lidar Valley
Mosquitoes		Lakes and swamps
Flies		Everywhere
Sand flies		Everywhere
Fleas (bugs)		Everywhere
Locusts	Haalv (Attack crops)	
Caterpillar	Mohur (Attacks deciduous trees)	
Animals		
Barasingha		Sind & Lolab valley,
Ibex		Ladakh
Musk deer	Rous	
Fox	Loh	
Monkey	Ponz	Panjal mountains
Black dear	Haput	Lolab Sind
Rats and mice	Gagar	Everywhere in Kashmir
	markhor	Kazinag, Pir Panjal
Wild dog	Ram Hun	Ladakh
Leopard	Seh	Pir Panjal
Brown deer	Wozul Haput	Extinct now.

"Extinction" is a word of worry for those who value the wild life in this mountainous land of diverse physical features and varied fauna. The State Government has passed some measures to protect some of the wild animals like: [1]

1. Kashmiri Stag
2. Tibetan Gazelle
3. Musk Dear
4. Indian and Nilgiri Langur
5. Himalayan Ibex
6. Himalyan brown bear
7. Bengal hercupine
8. Four horned antelope
9. Barking Deer
10. Nicobar Megapode——Bird
11. Sherian white Crane
12. Mountain Quail
13. Desert Cate Marmots
14. Martins
15. Crocodile
16. Gharial

Reserves of wild life are being revived with the establishment of new reserves at Hokra, Mirgund, Haigam in Kashmir. In Jammu province similar work has begun at Nandini, Vaishnodevi, Ramnagar. Suitable parks are being laid and developed. There is sufficient scope for new game reserves at Haidarpore, Nambal, Shalbug, Anchar, Sangam, Gad Khud. Such farms and *rakhs* when created will help wild life to spread and widen the scope for fur-bearing animals.

In such ambitious projects it is not the investment but a sound and technical follow up that can ensure growth and development.

MEDICINAL PLANTS

Plants are probably amongst the most important raw materials for obtaining valuable drugs used in medicine throughout the world. Because of its unique geographical position, climate and soil the State of Jammu and Kashmir is the most important region in India with a wide range of flora used in *Ayurvedic*, *Unani* and other modern systems of medicine.

A large number of plants like Artemesia *podophyllum hexandrum*,

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[1] The Jammu and Kashmir Wild Life Protection Act of 10.1.1979.

Physochlaina Bealata corea deltoids etc. are still exploited from wild sources in various regions of Jammu and Kashmir. However, obtaining of raw material from wild sources creates considerable difficulties. Quality raw drugs from wild collection is not too dependable because people involved in the collection of these plant materials are not trained and this can result in adulteration and also in harvesting plant materials at wrong times. Indiscriminate collection of some plants has already resulted in their exhaustion from the material sources. Belladona Atropa (*A. acuminata*) is one of the examples. At one time before the year 1955 A.D. more than 200 qtls. of Belladona leaves and roots were obtained from the forests. Because of indiscriminate collections this has now gone down to less than 10 qtls. annually.

Attempts made for scientific cultivation of both the indigenous and exotic plants were started in the State of Jammu and Kashmir in the mid-'forties. Initial trials were carried out by the then Drug Research Laboratory (now Regional Research Laboratory) for the introduction of plants in Kashmir from France, U.S.A, U.S.S.R and U.K. Methods of cultivation of various plants were worked out under different climatic conditions obtaining in the State of Jammu and Kashmir. On the basis of these experiments, large scale, farms were set up at Yarikha (2,133.6 m), Manasbal (1776 m), Bonnera (1,500 m), Allowpora (1,500 m) and Zainpor (1,600 m) in Kashmir and Katra, Chakrohi and Miransahib in Jammu province in the early 'fifties for the cultivation of these plants on a commercial scale. These farms were transferred to the Central Indian Medicinal Plants Organisation in the year 1964, and not practically all the important temperate plants used in modern medicine are produced on these farms.

DISTRIBUTION

There are very few States like Jammu and Kashmir in India where there is so much variation in climate and soil within such a small area. Climate in Jammu and Kashmir varies from tropical and subtropical. This is a great advantage for growing a large variety of tropical, subtropical, temperate and alpine plants. The Central Institute of Medicinal and Aromatic Plants (C.S.I.R) has in recognition of the variety in climate and altitude developed cultivation methods at places appropriate for individual plants.

A large number of wild plants used in the *Ayurvedic* and the *Unānī* system of medicine are, however, extracted from natural resources in Jammu and Kashmir.

Cultivation of medicinal plants requires careful study of soil analysis and fertilizer trials in order to determine the best conditions for growth of these plants in different regions. These studies and also the improvement of these plants are being carried out by the Regional Research Laboratory and the Central Institute for Medicinal and Aromatic Plants in both Jammu and Kashmir provinces.

Harvesting period of most of these plants begins from July and ends in September, a time which is good for harvesting, collecting and drying of these plants.

Medicinal Plants Used

S.No.	*Kashmiri Name*	*Specific Name*	*Use as medicine*
1.	Babuna	Cotula anthemoides Linn.	Rheumatism Stomach ache
2.	Banafsha	Viola serpens L.	
3.	Brimposh	Nymphaea alba L.	Antiporidic
4.	Sulia	Cydonia vulgaris Pers.	Demulcent for softening
5.	Betsa	Salix viminalis L.	Cooling remedy in fever for feet used locally.
6.	Gao Zaban	Onosma bracteatum Wall.	Heart tonic
7.	Damtali	Adiantum capillus-veneris L.	Expectorant
8.	Katar-kunda	Astragalus muticeps Wall.	Toothache
9.	Lal-post	Papaver somniferum L.	Heart. Cardiac tonic
10.	Gurgas or	Gramen	Snake bites externally
	Ganger	Grewia populitolia Vahl.	—do—
11.	Isband	Peganum harmala L.	Colds, Rheumatism
12.	Kwiklapot	Cuscuta pedicellata	Laxative
13.	Kashmal	Berberis lycium Royle	Cholera

(*Contd.*)

1	2	3	4
14.	Krits	Dioscorea deltoidea Wall.	Diuretic (Dose : one dram)
15.	Pahalmund	Pyrethrum indivum D.C.	Wounds inflicted by bear
16.	Panchpatri	Geranium rotundifolium L.	Burn wounds
17	Atis	Aconitum heterophyllum Wall.	Substitute for quinine, Tonic
18.	Sheoram gas	Mentha sylvestris L.	Wounds inflicted by sword
19.	Shahtara	Fumaria officinalis L.	Internal skin disease. Cooling drink in fever.
20.	Suru krilu	Rubus saxitilis L.	Dropsy
21.	Sutsal	Malva rotundifolia L.	Expectorant
22.	Tetwen	Artemisia sacrorum Ledeb.	Killing worms in body.
23.	Tromb	Fagopyrum esculentum Moench.	Anodyne, soothing pain
24.	Wan bubr	Mentha longifolia	Wounds inflicted by bear (as dry powder)
25.	Wan Pran	Allium rubelium Bieb.	Laxalive, Stimulant

These are some of the most important plants used in *Ayurvedic*, *Unani* and the most modern systems of medicine collected from wild source and their uses are given hereunder. In addition to the plants mentioned above, the following plants are cultivated commercially on large scale mostly on the farms of the Central Indian Medicinal Plants Organization.

(1) Belladonna (Atropa acuminata)

Belladonna grows in the entire State of Jammu and Kashmir and more particularly in the Kashmir valley. This plant grows at an altitude of 2,800-5,500 ft. above the sea level. It is a perennial herb about a metre high with acuminate leaves and globular cherry-like fruits. The plant grows wild in the forest areas where there is sufficient humus for supporting good growth. As an undergrowth, it is also found in alpine and fern forests. Belladonna is at present cultivated on a large scale, at Yarikha, Manasbal, Bonnera and Allowpora farms in Kashmir and 28-30 tonnes of the dry Belladonna leaves are produced annually. This is sufficent to meet the entire requirements of India. The leaves contain on an average 0.4-0.5 per cent total alkaloids. Seedlings are planted either in spring or in autumn. Application of nitrogenous and phosphatic fertilizers is useful in raising the yield of the green herb and of the total alkaloidal content. First harvest is taken after four months and thereafter cuttings can be obtained every 2-3 months. The plant is kept as a perennial for 3-4 years and 5-6 harvests are obtained during the growing season from April to November. The leaves are harvested when the plant is in flower, and they are dried in the shade. On an average 1000-1500 kg dried leaves may be obtained from one acre of land.

(2) *Pyrethrum* (*Chrysanthemum cinerariaefolium*)

Flowers of *C. cinerariaefolium*, popularly known as Pyrethrum are used as a source for insecticides. Cultivation of this plant was taken up by the Forest Department of Jammu and Kashmir State in 1931, and the plant was introduced in Kashmir from France. Initial trials were carried out at Baramulla and based on the results commercial plantation was taken up in the year 1941. This was further extended by the Drug Research Laboratory from 1951 to 1954. As at present, Pyrethrum is cultivated solely on farms of the Central Indian Medicinal Plants Organisation and 25-30 tonnes of dried flowers are produced annually.

Pyrethrum seeds are sown in nurseries in spring or in early autumn and transplanting is done in the following spring or autumn. During the first year of growth, very little yield is obtained, and normally second and third years give good yield. The plant is grown as a perennial for 5-6 years. On an average 200-250 kg dried flowers with an average of 1.0 per cent Pyrethrin content, are obtained per hectare. Recent experiments have shown that applications of nitrogenous and phosphatic fertilisers results in increased yield of flowers.

(3) *Japanese Mint* (*Mentha arvensis*)

Essential oil obtained by steam distillation of *M. arvensis* leaves, is one of the most important essential oils used in medicine, perfumery, cosmetic and flavouring industries. The oil is a source of an important basic chemical called menthol, which is used widely in toothpastes, mouth washes, cough drops and medicinal mixtures, as also in chewing gums, tobacco, confectionery and alcoholic beverages. It is an excellent carminative, gastric stimulant and diuretic.

This plant was obtained from Japan and introduced in the Jammu and Kashmir State by the Drug Research Laboratory (now Regional Research Laboratory) in 1954. Initial experiments were carried out in Jammu. On the basis of agro-technology developed at the research farms of the Regional Research Laboratory, Jammu, commercial production of this crop was taken up at the Drug Farms, Chakrohi (Jammu) and from there it has spread to various parts of the country.

Most of the Japanese Mint oil is now produced in Uttar Pradesh and Punjab and the cultivation of this plant in Jammu is confined only to the farms of the Central Indian Medicinal Plants Organisation at Chakrohi.

(4) *Peppermint* (*Mentha piperita*)

B.P. Grade Peppermint oil, which has a superior aroma and taste as compared to Japanese Mint Oil, is obtained by steam distillation of leaves of the *Mentha piperita*. This plant was first introduced by the Drug Research Laboratory, Jammu, in the year 1954 in Kashmir valley. It was further experimented upon by Regional Research Laboratory and the Central Indian Medicinal Plants Organisation. As a result of the agro-technology developed by these organisations, Peppermint is now being cultivated in Jammu and Kashmir. Peppermint is a temperate plant and the best quality of oil can be produced only in the Kashmir valley. It also grows fairly well in the Jammu province. However, plants grown in Jammu are of lesser commercial value. Peppermint oil has a sweet aroma and taste and is used as a flavouring agent in cough mixtures, tooth pastes, etc.

(5) *Ergot of Rye* (*Claviceps purpurea*)

The name 'Ergot' is applied to dried sclerotia, found as a result of infection of the Rye plant by the fungus *claviceps purpurea*. This raw material is the only source of Ergot alkaloids used widely, in medicine, to stop post-mortem haemorrhage and for the treatment of migraine.

Rye and the fungul infection thereof was introduced by the Regional Research Laboratory, Jammu and Kashmir in collaboration with the Central Indian Medicinal Plants Organisation. Indigenous technology has been developed for cultivation of this plant both in Jammu and in Kashmir as a result of collaborative work of the Regional Research Laboratory and the Indian Medicinal Plants Organisation. Kashmir provides better climate for cultivation of Ergot, and the yields obtained from the Kashmir farms are rated to be the highest in the world. The farms of Central Indian Medicinal Plants Organisation have been producing Ergot in the Jammu and Kashmir State for the last ten years. At present approximately 15-16 tonnes of Ergot is the raw drug produced on these farms annually. This is sufficient to meet the entire requirement of the pharmaceutical industry in the country.

Rye seeds are planted during the months October-November. The plants flower in December-January in Jammu, when they are artificially infected with fungus. The Ergot matures some time in May-June and the sclerotia are harvested by hand picking. In Kashmir the Rye plant remains dormant during the winter months and flowering occurs in April-May and the sclerotia is harvested in the month of June.

(6) *Ammi majus*

Ammi majus, an Egyptian plant, was introduced in India at Jammu by Central Indian Medicinal Plants Organisation in 1965. Seeds of this plant are the source of an important chemical called Xanthotoxin used in the treatment of Leucoderma as also as a constituent of the cosmetic sun-tan lotions.

Seeds are planted in October-November in Jammu, and harvesting is done in April-May. A hectare of this crop yields 600-800 kg. dry seeds, cotaining 0.8 to 1 per cent Xanthotoxin.

In addition to the above plants, other plants which have been grown successfully on experimental scale, are:

1. *Ammi visnaga*
2. *Digitalis lanata* and *D. purpurea*
3. Lavender (*Lavendula officinalis*)
4. *Salvia sp.*
5. *Hyoscyamus muticus*
6. *Hyoscyamus niger*

7. *Datura innoxia*
8. *Datura metel*

Following important plants, used in modern medicines, are being exploited from their wild habitat in Jammu and Kashmir :

1. Dioscorea deltoidea

Dioscorea deltoidea is distributed mainly on the semi-arid mountainous slopes throughout Jammu and Kashmir, at an altitude ranging from 100 m to 300 m. It is a dioscious, spiralling, perennial climbing herb. Rhizomes of the plant contain a steroidal sapogenin called Diosgenin. Diosgenin is one of the most important chemicals used for the synthesis of cortisone, sex hormones and oral contraceptives used widely in modern medicine. The rhizomes are collected in autumn, washed free of soil, cut into small pieces and dried in the sun. The material is collected under the control of the State Forest Department, who sell the dried rhizomes to Drug Research Laboratory where Diosgenin is produced commercially. Jammu and Kashmir provides a fair percentage of the raw material for the pharmaceutical industry in India. Experiments carried out at the farms of the Central Indian Medicinal Plants Organisation have indicated that this plant may also be cultivated and a pilot scale plantation has been established at Manasbal Farm.

2. Physochlaina praealta

This is a perennial herb found growing wild in the arid regions of the State largely in the Ladakh province. The leaves are collected during autumn and dried in the sun. The dry leaves contain 0.6-0.7 per cent alkaloid Hyoscyamine.

3. Datura stramonium

Datura stramonium grows wild in most part of the Kashmir valley as a weed. Leaves are collected during autumn and dried in the sun. The dry leaves contain 0.3-0.4 per cent alkaloidal mixture of Hyoscyamine and Hyoscine.

In addition to the above important plants, *Podophyllum sp.* and *Valleriana sp.* are exploited to a limited extent and large number of crude drugs used in the Ayurvedic and the *Unani* system of medicine, are also collected from the natural sources in both provinces of the State.

Chapter VII

AGRICULTURAL LANDSCAPE

LAND UTILIZATION

Agriculture constitutes the single most important industry of the Jammu and Kashmir State. Like all underdeveloped regions of India, the State of Jammu and Kashmir needs a careful study of agriculture and horticulture on the basis of crop-combination regions to attain its plan targets in soil improvement, selection of better seeds, healthy livestock and increase in the yield of food crops.

The State of Jammu and Kashmir covers an area of 53,664.2 sq. km. Of this, 138,686 sq. km. constitute the rural and 305.4 sq. km. urban. The total area calculated as urban in the province of Kashmir is 189.3 sq. km. and 115.2 sq km. in Jammu. This signifies that the entire State of Jammu and Kashmir is rural with 6,503 villages according to the Census of India (1971). The table below shows the number of districts with total population.

Name of District	Number of villages	Total rural population
1. Anantnag	1,170	322,684
2 Srinagar	687	758,046
3. Baramulla	1,020	709,981
4. Ladakh	235	97,382
5. Doda	652	322,684
6. Udhampur	617	310,427
7. Jammu	1,063	540,401
8. Kathua	536	249,586
9. Rajouri	368	208,976
10. Punch	158	156,984

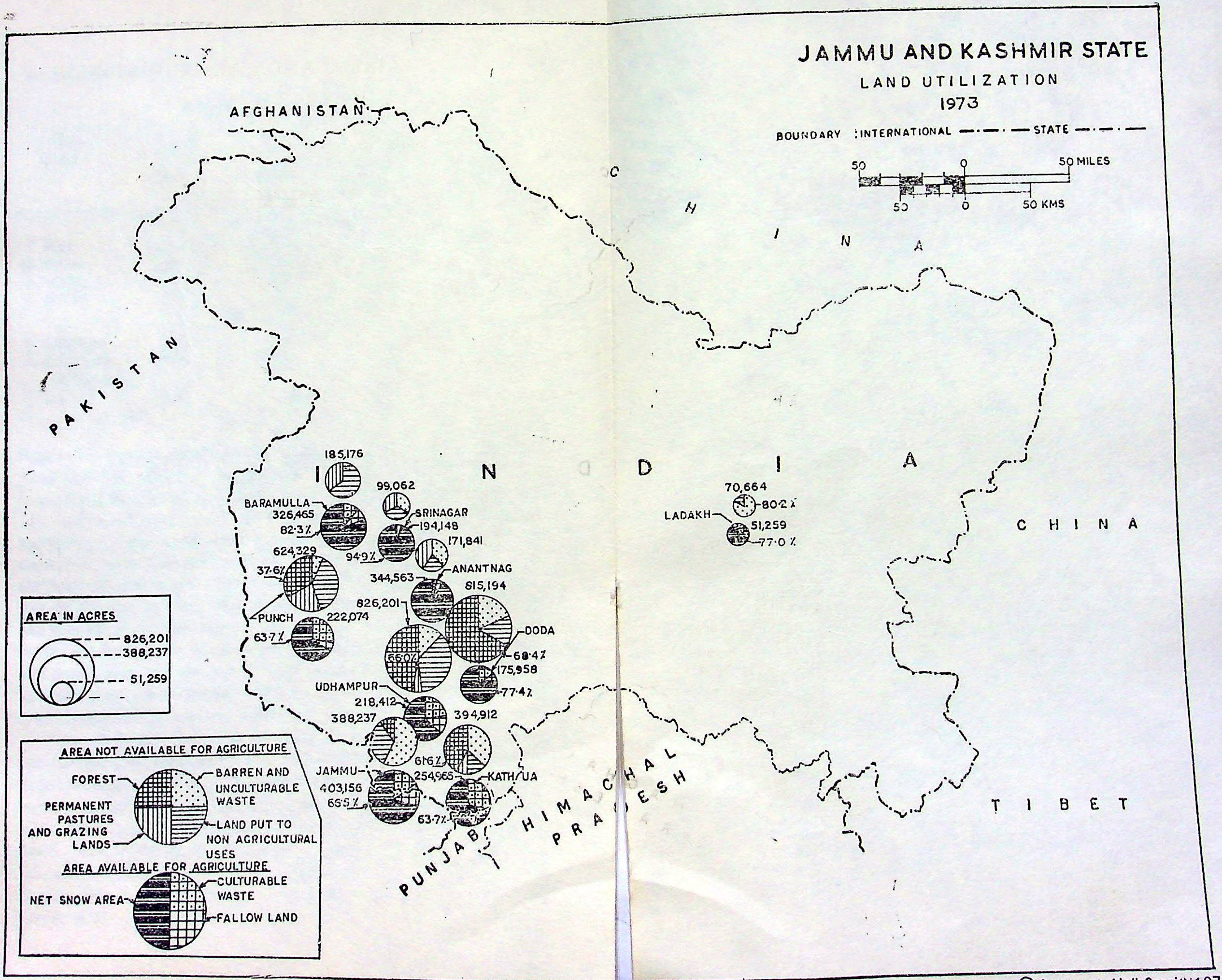
Generally speaking, 30 per cent area is used for non-agricultural purposes, it being uncultivable. Out of the cultivated land, more than 10 per cent area is still fallow and with the increasing facilities of irrigation this area will add to the existing acreage of cultivation. A perusal of the agricultural statistics for the entire State of Jammu and Kashmir reveals that of the total fallow lands, nearly nine-tenths were in the province of Jammu and the rest in the province of Kashmir. In the province of Jammu more than 78 per cent area of cultivated land is sown twice, it being double-cropped area, as against 21 per cent area in the province of Kashmir. A careful analysis of the net area sown districtwise shows that double cropping is common in the districts of Jammu Province. The reason is that in the valley of Kashmir the season of maturity for crops is small compared to that of the province of Jammu. The method of suitable crop rotation to enable lands to be cultivated more than once will, indeed, add to the agricultural yield.

Recently statistical studies have been made in some districts regarding the value of agricultural yield per acre along with the value of crops to get a comparative idea.

District	*Value of output per acre*	*Paddy*	*Maize*	*Wheat*	*Barley*	*Tobacco*	*Percentage value*
Kathua	185.95	63.5	22.4	5.7	1	1	9.2
Jammu	121.37	22.9	7.7	66.2	1.9	0.4	0.4
Udhampur	105.91	11.9	54.7	26.0	3.9	0.2	3.3
Srinagar	167.22	63.5	22.4	5.7	0.1	0.1	8.2
Ladakh	247.02	N.A	N.A	79.8	19.9	0.3	N.A

Agricultural experts have suggested a comparative study of processes of cultivation in Finland and Switzerland where geophysical conditions are similar to those in Kashmir. Such a study will stimulate research in soil analysis and its behaviour towards crop cultivation. Besides the use of manures, chemical fertilizers and green manuring will help in planning cultivation for an increase in yield which is low at present. The following information is based on three year's averages:

Map 6



JAMMU AND KASHMIR STATE
LAND UTILIZATION
1973

Based upon Survey of India map with the permission of the Surveyor General of India.

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Cultivated Area and Yield

Principal Cereals	*Area in 000 Hect.*	*Annual Yield tonnes*	*Average Yield per Hect. (Kg.)*	*India average Kg per Hect.*
		Primary Cereals		
1. Rice	226.5	280,353	1,119	1,036
2. Wheat	179.5	109,495	610	731
3. Maize	245.0	194,040	782	993
4. Barley	17.0	20,995	1,235	734
		Secondary Cereals		
5. Sesamum	8.00	3,000	375	183
6. Rape seed and Mustard	26.00	15,990	615	299
7. Linseed	10.00	6,000	600	159

RICE

Rice in the husk is called paddy. In Kashmir, it is called *Dhānya* or *Shāli* and *Dhān in* Dogri, Pahari and other dialects. It is the staple food of the Kashmiris and constitutes the staple crop of Kashmir. The traditional use of rice goes back to antiquity and in fact there is hardly any ritual in Kashmir, from brith to death, in which rice cooked or uncooked does not figure. The total acreage under rice in the State of Jammu and Kashmir is 533,000 acres, out of which the province of Jammu has 159,000 acres, and the province of Kashmir has 374,000 acres. Rice has as many as 50 varieties and in Kashmir those well known are *Mushka-Budij*, *Looli anjul*, *Shastar byol*, *Basmat* and now China. In the province of Jammu, Basmati is grown. In Kashmir paddy is cultivated even up to a height of 274 m and above if mechanical irrigation is available by perennial streams.

Soon after frost and ice disappear, the advent of spring imparts a new life to the landscape and the rise in temperature enables the soil to get ploughed and ready for seed cultivation either broadcast or by nursery transplantation. The nursery method was in vogue in the past when the temperature continued to be very low even up to the end of April. Now a change in the climatic cycle and variation towards increase in temperature in winter months have enabled direct sowing of seed. For surer results, the transplantation method is still commonly used. Every care is taken to prepare the soil-bed in early

December when snow and ice are allowed to cover it to pulverise soil. In March-April, a good dose of farmyard manure prepares the field and water is carefully spread over to ensure an even dose of soil nutrients in the form of liquids which help soaking. Light seeds are thrown off and heavy seeds allowed to remain in water and then sown broadcast. From April to May the sprouted seeds are sown. The seedlings peep out above water when these are transplanted. Rice is grown in the alluvial tracts where irrigation is possible, as in the lower slopes of the Chenab at Udhampur, Bhadrwah, Kishtwar, Riasi and Kathua. All this rice is of the coarse variety. It is only at Ranbirsinghpur near Jammu that fine quality rice is cultivated. A small quantity of rice is also grown in Rajouri and Punch. The processes of cultivation extend from April-May to September-October. Rice is more suited to the climatic conditions of the valley of Kashmir where there seems to be a considerable scope for increasing its yield with research and experimentation than elsewhere in the State.

WHEAT

Wheat is not an important crop, though its use as food is increasing now. There are about 179.5 thousand hectres of land under wheat distributed as below :

Province	*Acres under wheat in Hectares*
Kashmir	78,000
Jammu	331,000
Ladakh	7,000
Total	416,000

Even though a minor crop, wheat cultivation is spread in many patches of alluvial lands in the entire province of Jammu where it is grown for local consumption. Sown in autumn when the soil is warm and wet after the retreating monsoon, it grows during winter when light showers of rain assist its ripening. The areas of wheat cultivation are spread in the districts of Jammu, Ranbirsinghpur, Samba, Kathua and Riasi.

In the valley of Kashmir wheat is cultivated just like grass and is an auxilliary plant, in the sense that it is grown on elevations where irrigation is not possible and there is a small period for crops to mature. Sown in September or October, wheat ripens in June. The common variety is a red wheat with a small hard grain. The yield is still very low, almost half of that of the rest of India, as very little is done by way of weeding, manuring and ploughing of such lands. The valuable straw of wheat is used as fodder and is mixed with mud to impart strength to the plaster. The Surma disease that turns the grain into black powder with an obnoxious smell is still common in some areas where wheat is cultivated.

The yield of wheat per acre is about 7 maunds though in Kashmir it is even a little lower. In Jammu the yield is on the increase but the highest yield of wheat has been reported from Ladakh, where about 19,500 quintals are grown annually.

In recent years new varieties of wheat like C 250 have been cultivated as these are resistant to yellow rust. The use of bread is becoming common and *phulkas* and bread have entered the common diet which is a mixed fare now in keeping with the whole someness of proteins, fats, carbohydrates, vitamins and other nutrients of a normal diet.

Wheat cultivation will extend towards higher elevations where rainfall ranges between 50 to 75 cms.

MAIZE

Maize (*Makāi*) is a food crop of considerable importance in the entire territory of Jammu and Kashmir. As the altitude increases from 2,438 m above sea-level the importance of maize cultivation and maize consumption increases. Its consumption adds to the bodily heat in cooler conditions of temperature at high elevations. The distribution of maize cultivation is shown below :

Province		*Area is acres*
Jammu		2,091,000
Kashmir		303,000
Ladakh		Nil
	Total	2,394,000

Maize is sown in May-June and the harvesting is done in August-November. In all hilly and submontane regions, maize continues to be the staple diet of people. In the winter months, maize is preferred to other foodgrains particularly its flint variety in which the red-grained type predominates.

Reclaimed swamp is the ideal land for maize and enormous crops are raised in good years from the black peaty land lying under the banks of the river Jhelum. Villages at a very high elevation inhabited by the graziers (*Gujjars* and *Bakerwals*) grow maize at these heights.

Heavy manuring makes possible high yields of maize. Plenty of dung of buffalows, cattle, sheep and goats is available at these heights where the maize stalks are allowed to rot in winter snow thereby making the land fertile. These homestead fields are sown in May or June when womenfolk work in them. The yield is thus sweet red maize, which is prized for its nutrition. Maize is preserved even for three years but a disease known as Sas blackens it.

BARLEY

Barley is not esteemed as food even in Kashmir where it is grown along with wheat. A variety of this crop known as Tibetan barley is cultivated in the hilly areas where most of it is cut before ripening and used as fodder. There are about 58,000 acres under barley out of which 51,000 acres are in the province of Jammu. In the province of Kashmir barley covers hardly 5,000 acres. Ladakh has an area of 2,000 acres under barley in scattered patches. It is a common practice now to mix barley with wheat which it resembles in appearance. Tibetan-barley is grown at high elevations but this grain lacks chaff scales adhering to it.

AMARANTH (GANHAR)

Amaranth (*Ganhār*) is a beautiful crop sown after three or four ploughings. With its gold, coral and crimson stalks, the flowers present a beautiful appearance. The grain when ready is parched, then ground and eaten with milk or water, it provides heat to the body and is used by the Hindus on days of fasts.

OILSEEDS

Oilseeds have been cultivated from very early times. The extent of cultivation widens towards the higher altitudes in the Outer Plain where the alluvial patches of cultivable land are sown with these seeds. The Middle Himalayas and the valley of Kashmir also grow oilseeds as shown below:

Oilseed Distribution

Province	*Area in acres*
Jammu	28,000
Kashmir	67,000
Ladakh	1,000
Total	96,000

Of all the commercial crops, oilseeds of rape, mustard and linseed are important. Efforts to extend their cultivation have met with success in recent years. About 3,000 acres have been added to the cultivated area of oilseeds from 1959 to 1963.

Long ago oilseeds were crushed for oil which was accepted by the State as payment of revenue. The practice is no more in vogue. Generally rape seed is good for lighting and oilseed for eating. But no pure form of oil is available now as walnut, apricot and other oil-producing substances are crushed together to produce oil.

There are twenty oilmen's cooperative societies supported by the State with grant of loans for the purchase of oilseeds and building of the common stores required for the puspose with the help of trained technicians from Wardha. It is possible that improved *ghanies* will be made available to these societies. The industry is well distributed in all parts of the State.

FRUITS

Like all regions with a modified form of the Mediterranean type of climate, the valley of Kashmir, though classed as temperate-continental type, has a marked characteristics of a wet winter which warms up soon after April when snow and ice begin to melt in the higher elevations.

Fruit cultivation has been known from very early times. In recent years fruit cultivation has extended in the State with readily available facilities of better seed, nursery culture and insecticides. The following table shows the acreage under the different fruits :

Province	*Area in acres*	*Fruits*
Jammu	6,000	Mangoes, bananas, tapioca, oranges, apricots
Kashmir	40,000	Apples, cherries, plums, peaches, apricots, walnuts
Ladakh	1,000	Apples, apricots, grapes, walnuts

As a fruit-growing region, the State of Jammu and Kashmir is of considerable importance. Of the total temperate fruits grown in the country, more than three-fourths are provided by the territories of Jammu and Kashmir alone. Both in quantity and in quality fruit cultivation is an important source of capital to the State as shown in the following table :

Name of fruit	*Output in maunds*	*Value in rupees*
Apples	700,000	52,500,000
Pears and peaches	175,000	5,250,000
Cherries	75,000	1,500,000
Plums	2,500	1,895,000
Apricots	75,000	187,500

The importance of fruits needs no emphasis. With an increase in the standard of living, consumption of fruits as a protective food will also increase. If the consumption per head of fruits in a balanced diet is placed at two ounces fruit cultivation will have to be extended. This ensures a future for horticulture in the State where many schemes have been prepared in recent years with field experimentation and as many as nine hundred samples of walnuts alone. Survey and investigation, experimentation and study of soil will help fruit cultivation to extend itself over 50,000 acres as envisaged in this Plan to meet the demand for temperate deciduous fruits in the country.

The Department of Agriculture is distributing fruit-plants as shown below :

Year	*No. of Fruit-plants distributed*
1955-56	124,566
1956-57	135,379
1957-58	260,466
1958-59	211,000

The fruits cultivated now are mulberry, bitter cherry, plum, apple, pear, vine, walnut and pomegranate. These are indigenous to Kashmir. Apricot and peach have spread as a result of cultivation. These fruits ripen in succession and supplement food. At present, fruits and vegetables form important commercial crops. The following table shows the growing extent of such cultivation and the figures are for the year 1961 :

District	*Fruits and vegetables (area in acres)*
Kathua	621
Jammu	2,852
Udhampur	1,116
Doda	1,135
Anantnag	15,593
Srinagar	15,974
Baramulla	9,204
Punch	174
Ladakh	1,272

Selection of sites for orchards for temperate fruit cultivation (apples, pears, cherries, plums, apricots, peaches, walnuts, almonds and grapes) has attained success. A study of soil with its water and air drainage in deep loam or sandy loam free from alkali has proved ideal for cultivation of fruits.

Supply of machinery, equipment and technical advice to the orchardists free of charge has greatly helped fruit cultivation. The training of gardeners and the establishment of a fruit research centre to protect plants will no doubt help in raising the fruit industry to the level where it can easily face competition from other horticultural areas of the country.

The rise of production and export is given below:

Year 1972.

Annual production of fruits.	152,000 tons
Annual export of fruits.	106,000 tons
Annual income by fruits.	9 crores of rupees

During the Fifth Five Year Plan 50,000 acres will be added to the existing areas particularly with vine cultivation for which substantial loan is being advanced to the farmers at the rate of 2,600 per acre. Many schemes will be introduced including plant protection and marketing. It is expected that about 3.50 lakh tonnes of fruit will be exported by the year 1980.

THE SAFFRON ZONE

Despite its non-nutritious character, saffron (Crocus sativus), alias *zafran*, is prized as a bouquet, condiment and a pigment. Curiously enough its cultivation is restricted to a flat-topped Karewa of alluvial or lacustrine material lying to the east of the river Jhelum in the valley of Kashmir, to the south-east of Srinagar, about eight km. on the right bank of Jhelum. The raised and flat surface is slightly sloping and enclosed by a semicircular mountain range enclosing the *Vihi* a group of villages.

The name karewa signifies a plateau-like elevation. Composed of sands, clays, loams and gravel these elevations appear like the glacial varves. The karewa of Pampur is absolutely flat and "builds the profile of a tableland." It is on this flat surface that saffron cultivation began from very early times. This area is just about one hundred and fifty feet above the level of the Jhelum river and the sloping plains have agriculture as the dominant form of land utilization. From the bank of the Jhelum the slope of the karewa appears like a buff worn down to a slope by weathering. It is on the slope towards the Jhelum that Pampur (ancient Padmapura) village is situated with saffron culture to its south. To the north-east of Pampur is Balhom, a large village with Voyan village to the north. The entire area is picturesque, well-known for its sulphurous springs of medicinal qualities.

ANCIENT RECORD

The reference in ancient literature reveals that this region was once a zone of considerable intellectual and commercial activity. According to Kalhana the village Padmapura (modern Pampur) was founded by Padma, a minister of King Lalitaditya. The question of how and when saffron cultivation began is interesting indeed. Tradition has it that a *Naga* (watergod) was afflicted with an eye-disease and could not be cured by the famous physician of King Lalitaditya. When the physician discovered the real identity of the watergod he bandaged his eyes, for the poisonous vapours which the watergod exhaled nullified the drugs used. At last the watergod was cured, and in gratitude he gave a bunch of flowers to the physician. These were the saffron flowers, the cultivation of which soon spread.

According to another legend popular among the cultivators, it is believed that Shogababa, a saint and philanthropist, moved by the abject poverty the inhabitants of Pampur moved God by his prayers. His prayers were accepted and on lifting a big stone from a spring in a nearby village a plant was discovered underneath. The cultivation of this plant spread soon towards the highlands and the seed multiplied itself under ground. Thus saffron became the cash crop of this zone.

SAFFRON CULTURE

The geography of saffron cultivation records that in lands lying between West England, Spain, Persia and Kashmir (32° N to 35° N) saffron was cultivated at one time or the other. Homer included saffron among other sweet-smelling herbs. Hippocrates and other Greek writers have made mention of saffron; and that "the crocodile's tears are never true save when faced where saffron groweth", is a well-known saying. In early Greek times it was the royal colour, and an extensive use of its water was made for smelling purposes and it was sprinkled as a perfume in halls, courts and theatres. After the Greeks, the Romans used it mostly in baths. The story of its fragrance is well-known when Nero entered the streets of Rome. Later on the spaniards and the Persians used it as a condiment with rice.

In Ireland a King's mantle was coloured with its dye and persons of rank used to wear a saffron coloured shirt. In England its cultivation dates back to early times. It is recorded that a Pilgrim from Tripoli secretly smuggled saffron plants in the hollow of his staff and its cultivation spread though its use was restricted to colour pastry and confectionery. This industry was localised in Essex and Cambridgeshire and supplied the needs of Europe. Just after the middle of the eighteenth century its cultivation died and the saffron cultivators, or "Crookers", as they were called, seem to have given up saffron cultivation after 1768 A.D.

The Arabs too cultivated saffron from early times and in 1961, saffron was exported as far north as Britain. Research has succeeded in finding out the orignal home of saffron and it is the town of Corycus (modern Korghoz) in Cilica. In the east cultivation of saffron extended up to China and use of its efficacy as a stimulant and a specific medicine is found in the Chinese *Materia Medica* (*Pum Saou*) 1552-78.

REQUISITES

The chief requisite for the saffron is a typical karewa soil, sand, clay, loam and gravel. The saffron sends its roots to depth and can thus search out water in the sub-soil. Since no other vegetation is allowed to grow on these lacustrine varves, therefore, the moisture content is utilised for the germination of saffron bulbs. The mean temperature in winter (January) is 29°F when snow covers the entire area providing a storage of water for agricultural use. In summer occasional showers reach this area across the Pir Panjal if the South West Monsoon is strong. Snowfall may seem to be the main precipitation but the fact is that rainfall in spring (April-June) is the real form of irrigation when the soil becomes wet to a depth of about two feet allowing grass to grow which is later ploughed in. Up to the beginning of July the upper bed is prepared and the soil is beaten with sticks several times till it is powdered to dust. It is a hard task as no plough or animals are used. There are small fields of saffron usually 102 x 6 m arranged in rows separated from one another by narrow ditches to divert drainage. In the ridges saffron corums are planted exactly like the potatoes. It is then that germination begins.

It is clear, that in autumn after harvest, the plots are furrowed and the soil covering let loose to make it fit for percolation in winter. Rain and snow give strength to the soil-bed, and in spring the entire saffron zone looks like a Pamir meadow covered with grass. This grass is allowed to be ploughed in as green manure imparting strength to the land. Moisture is suitable so long as it does not stick to the roots of the bulbs which need only wet soil. In this respect saffron cultivation resembles tea shrubs. Light showers help the growth as most of it evaporates and moisture is provided to the roots to grow. The moisture laden breeze from the west over the Jhelum loop is considered to be the necessary requisite for the spread of its cultivation, particularly because of its moderating influence in July, August and September.

UTILIZATION

This area under saffron is termed as So'na-kra'nd (a basket of gold) because of saffron cultivation. On the sloping karewa wheat is grown but higher up it is dry and dusty in summer. Of the three villages Kadalbal, Nambalbal and Drangbal about 1,3000 acres are cultivated with wheat, oil seeds, tobacco, fruits and pepper. The contour farming has helped in multiculture and this has considerably raised the yield. In the saffron fields there is little fragmentation of holdings as the operations are so very delicate. About 10,000 tolas of saffron are produced at a price of Rs. 20 per tola, it comes to about Rs. 200,000. The operations all through are delicate as all the processes connected with saffron cultivation are intricate. The picking of ripened flowers is done with great skill and manuring of the fields is also attended to with care so that the nutrition is below optimum. The picking is to be done with hand without trampling the soil below. The flowers thus collected are dried in the sun. The upper tip is red oranged but this is *shahi-zafran* (the best quality); and the quality produced from the white base of the stem is of inferior quality. Generally the sun dried flowers are beaten with sticks and winnowed carefully. On being thrown into water, light petals float and are dried. The remaining part of the flower sinks and is termed *Niwal*. The process is repeated till the inferior qualities of saffron are collected and dried.

Just to the north of Kishtwar in Middle Himalayas saffron is cultivated in Hatta and Matta (Puchhal). It is a flat elevated bank of Chenab (Chandrabhaga) resembling the Pampur Karewa (Srinagar), with an area of about 150 acres. The soil in this region is locally known as *Dudgura* but the quality of saffron is inferior. The entire region from Padar to Lingar in the Middle Mountains has this kind of soil and there is a possibility of extensive cultivation.

The danger of floods is the main difficulty but the deepening of the river bed will help the area to a great extent. The raising of bunds also is helpful. If this is done the farmer will be in a position to take a risk in experimenting with saffron cultivation and allow even the saffron fields to lie fallow and gain strength.

Nothing can be said with definiteness about the future of saffron cultivation. Attention is needed to be given to the scientific culture with research to improve and extend its cultivation.

Saffron enters into medicines, preparations and other indigenous drugs. More uses for it are being researched. Kashmir has virtually the monopoly of saffron cultivation.

VEGETABLES

The common vegetables are *knol khol*, pumpkin, brinjal, cucumber, cabbage, pepper, radish, potato, onion, tomato, ladyfinger, carrot and vegetable seed. Vegetable gardening is a common feature of farming and in recent years seed-growing has extended sometimes at the cost of food crops.

In Jammu every piece of land is utilized for growing vegetables since the facilities of irrigation by canal and tubewell are available now. In Ladakh four seed-multiplication-cum-demonstration farms have been set up at Kargil, Nubra, Murtse and Ranipur. In addition to making the farmer scientific minded for using chemical fertilizers and modern mechanical devices to improve yields, such experimental farms will help in making the farmer interested in growing this crop on these distant and elevated land.

PULSES

All kinds of pulses are grown in the province of Kashmir and the province of Jammu. Mong (*phasclus mung*) is commonly grown in rice fields to give the land rest and air the soil, as the roots run deep.

Mah (*phasclus radiatus*) is cultivated as *Mong*. It is tasteless but the yield is above 4 maunds per acre. *Muth* (*phasclus aconiti-folius*) is also grown in the fields and used as fodder. Peas are delicious white beans known as *Razmah*. These are grown extensively throughout the agricultural lands of Jammu and Kashmir.

Predominantly agricultural the State of Jammu and Kashmir has 81.41 per cent of its population in rural areas mainly dependent on agriculture. The net area sown is 7.06 lakhs hectares which is 29 per cent of the total area of 24.19 lakh hectares according to the village papers. The area sown more than once is 1.59 lakh hectares of 22.5 per cent of the net area sown. By and large it is a monoculture type of farming limited by the shortness of the growing season, severity of winter climate and topographical limitations. The decrease in yield is from 11 lakh tonnes in 1969 to 9.26 tonnes in 1972-73. 1970 shows how far a prolonged severe winter, drought in Jammu and hailstorm can be responsible for decrease in total yield.

Commercialization of agriculture by converting areas under food crops into orchards and vegetable seed farms have been a baneful result of recent years. An economic blessing for some it has added to the shortage of food production. There is no balance between the cultivation of food crops and non-food crops. With ease and importance in horticulture the tendency is growing for fruit cultivation. During the Fifth Five Year Plan "a substantial increase during the next plan and a target of 50,000 acres has been set". The Government will advance a loan for 27,000 acres and through private effort another 27,000 acres to make up an area of 54,000 acres for fruit cultivation.

Agriculture contributes about 36 per cent of State's income. Forestry contributes about 17 per cent and 9 per cent from animal husbandry and fisheries. More than 88 per cent of the total cropped area is under foodgrains but the State continues to be a food deficit region mostly due to low yields. There is heavy pressure on arable land as the average size of the farm holding is hardly 1.6 hectares. Central aid to the State of Jammu and Kashmir for food as subsidy continues.

Efforts to introduce high yielding varieties has shown some increase but its overall position of low yield has to be attempted on intensive basis since the extention of cultivation has geographical limitation. Even then some varieties have been introduced.

HIGH YIELDING VARIETIES

There has been an increase in the production of foodgrains as a result of high-yielding variety of new seeds. The table below shows the increase in area under three principal crops.

Area in Lakh Acres

Crop	*1960-61*	*1968-69*
Paddy (Rice)	5.60	5.91
Wheat	4.25	6.04
Maize	5.34	4.57

Production of some of the important crops from 1960 to 1969 is given below :

Crop	*1960-61*	*1964-65*	*1968-69*
Rice	25.19	43.27	44.99
Wheat	10.48	11.22	12.74
Maize	20.26	37.18	32.28
Barley	1.55	1.01	1.10
Bajra	0.78	1.55	0.69
Gram	0.53	0.54	0.54

Under intensive agricultural programme a number of high yielding varieties have been introduced. These are given crop-wise :

Crop	*High Yielding Variety*
Paddy (Rice)	China 1039 China 971 (For higher altitude above 1520 m)
Wheat	Lernea Rajo Sanora—64 S—308 R—21 Kalyan Sona Safed Lernea H.D. 1593. H.D. 1593 N.P. 818
Maize	Him 133 Ganga Safed—2 Composite C—1 Composite C—2 Pop Corn

Chapter VIII

LIVESTOCK

IMPORTANCE AND DISTRIBUTION

Agricultural economy primitive depends on livestock. The role of livestock is significant in areas where primitive methods of culivation are still followed.

In the province of Kashmir, where all agricultural operations are timed, cattle suit the farmer best. Both are conservative in their habits. Till recently when mobility of cattle was not possible, it was doubtful if a slight change in living conditions could suit cows, oxen and bullocks. With the rise in altitude towards the western uplands (karewas) and the eastern slopes of the mountains, geographical conditions steadily change and do not suit the mobility of livestock. That is why fodder is stored in houses and consumed by cattle during winter months when these live under the farmer's roof. Living together provides warmth in winter to the inhabitants. That also facilitates looking after livestock.

DISTRIBUTION

In every village the *Patwari*—the village accountant—keeps a record of livestock in his land record. This is known as *Goshwar*. Entries are made often to keep these figures up-to-date. After every three years, a report is prepared at the *tahsil* level to examine the position of the livestock population in its increase and decrease. The figures for 1961 and 1971 are given below:

Jammu and Kashmir State Livestock (*in lakhs*)

	1961	*1971*
Cattle	18.31	20.57
Buffaloes	4.0	4.92
Horses and ponies	17.39	N.A
Sheep	0.64	6.72
Goats	0.41	5.69
Poultry	16.08	N.A

The figures of livestock were fairly high for the whole area of the State of Jammu and Kashmir till the invasion by Pakistan in the year 1947. Parts of the territory were lost to Pakistan along-with 10,00,000 heads of livestock. By the year 1956, economic stability prevailed on the Indian side of the Cease-Fire Line and livestock settled down to work as of yore. Agricultural activity progressed fast with new breeds from outside.

In Ladakh, the livestook position improved, as is shown below:

Livestock in Ladakh

	(in lakhs)
Sheep and goats	3.15
Cow, oxen	1.42
Buffaloes	nil
Zoes and zomoes	0.10
Horses, ponies	0.08
Yaks	0.50
Poultry	0.1 0

As already stated, there is no habitable tract of land not uncultivated in one form or another. Animal husbandry has its own place in the economy of these settlements, whatever be the altitude. However, geographical factors determine the type of livestock and their distribution in these diverse territories.

In Ladakh efforts are being made to improve the milk yield of the cattle by cross breeding with exotic animals. The breeding farm at Nubra (Ladakh) is being reorganised for yak breeding.

The total sheep-goat population of 0.77 lakhs (sheep) and 1.06 lakhs (goat) is bound to increase with selective breeding. Since *Pashmina* goats are not available because of annexation of that territory by China new exotic *pashmina* breeds from USSR, Mongolia and Afghanistan are being selected in the sheep farms at Matho and Sanko. Three veterinary hospitals at Leh, Kargil and Dras prove of great help and advice to the inhabitants of Ladakh who are great rearers of livestock with species like yak, demos and *pashmina* goats unknown in India.

SHE-BUFFALO-COW-TRACT

In the Outer Plain, the districts of Kathua, Jammu, Udhampur and Rajauri have a dry winter followed by a hot summer and monsoon rains. The entire tract is suitable for she-buffaloes and cows, the distribution of which is given below:

Year	*District*	*She-buffaloes over* *3 years*	*Cows over* *3 years*
1965	Kathua	25,397	58,802
	Jammu	28,137	78,662
	Rajauri	36,591	N A.
	Udhampur	45,568	75,783

The number of she-buffaloes decreases towards higher altitudes. The bulk of milk for dairy products is provided by this tract where grass, maize and oilseed cake form the main fodder. Cross breeds have improved livestock and the yield of milk. Beyond Udhampur, the district of Doda is rich in livestock. A typical Middle Mountain tract it leads in sheep. Green grass in higher slopes of mountains provide fodder to livestook. The zone of mobility for the graziers falls within the Middle Mountain region.

THE COW-SHEEP-GOAT TRACT

The river valley of the Jhelum has small but hardy cattle, black or grey in colour and numbering over 308,157 in the three districts of Anantnag, Srinagar and Baramulla. Bulls have been imported and the breed has improved considerably. Fodder consists of rice, maize, straw and a kind of hay. In summer, swamp grass known as *Nari* and *Khur* is given to cattle. Cattle mostly depend on mountain meadows for grazing. Villagers take their livestock to the mountain glades like Toshmaidan and Sondipur-Dragar. The sheep number over 973,707 and the goats 111,020. These supply wool, manure, milk and hide. Beyond the 2,133 m contour, the economy of the graziers depends mostly on livestook. The coarse wool of Kashmir is collected from these animals. A kind of fine quality wool is collected from sheep to the west of the Wular Lake where mulberry leaves are to be found in plenty. It is fine fodder prized for producing good quality meat and wool.

THE YAK-ZOES-ZOMOES-GOAT TRACT

The entire district of Ladakh with an area of 97,773.3 sq. km is a typical tract where semi-Arctic cold in winter with bitter winds suiting yaks and the zho, which is a cross breed between the yak and the common cow. The *zho* is a drought animal for this climate—par excellence. Beyond 2,743 m in height donkeys, ponies and goats feed on upland pastures up to 396 m. Wild sheep (Ovis, Vigni, Ovis Ammon) are found up to 6,400 m in the Nubra valley. The per head number of livestock in Ladakh is six. Increase in wheat, barley, buck wheat grass and grim, a kind of barley which ripen even above 4,4114 m above sea-level in this mountain tract, will supply fodder. Feed and fodder development schemes are expected to yield some result in the Fifth Five Year Plan.

BREEDS

Before the year 1947, there was little restriction on the movements of livestock. In fact, more than 400,000 graziers moved on higher altitudes across the borders of the State into the then province of the Punjab and the North-West Frontier Province. In winter, soon after October, these trans-border graziers moved down to lower and warmer areas with their livestock. In summer, they moved up again to the grassy glades of the mountains to feed their livestock. The 2,133 m contour round the valley of Kashmir up to the 3,657 m contour could be conveniently taken as the zone of intense grazing activity for sheep and goats. These give hides, milk products and a little wool. The extent of yield in wool and its distribution are given below :

Type of Sheep	*Quality of Wool*	*Annual yield per animal*
Karnah	Fine	1-2 lbs
Gurez	Lustrous	1-2 lbs
Changthang	Superior	4-8 lbs
Kashmir	Coarse	2-3 lbs

The goat of Kangan is believed to be the best mutton-goat in India. The Beetal goat of the Outer Plain in the Jammu Siwaliks is the best milking goat but the breed has suffered since its isolation has not been possible.

The Pashmina goat whose native home is in Tibet (Rupshu, Changthan, Nubra and Zanskar), though within Indian territory, is now under the control of China. Since the invasion by China in the year 1962, the *changpas*, as these *Pashmina* goat-owners are called, cannot freely move towards the district of Ladakh. It has been a great setback to the export of wool and other products of the State. The *Gaddies* and the *Bakarwals* move now within the territories from lower to higher altitudes with their livestock. The products they deal in are meat, milk products, hides, skins, bones, horns, hoofs, wool and hair.

A thorough survey of the sheep-raising tracts is required to study the habitat of the graziers and their livestock. Estimates of the potential availability of animal products like meat, bones, intestine waste, guts, tallow, horns and hoofs are also required. Such a study can help in ascertaining the number of dead animals and the number of hides exported every year. At present there are two flaying centres—at Verinag (Kashmir) and Bishnah (Jammu) where this kind of work has been taken up seriously.

DAIRYING AND MILK SUPPLY

Total production of milk in the State of Jammu and Kashmir has been culculated at 1,120,000 quintals. The production of byproducts is as under :

Milk Product	*Quintals*
Clarified butter (ghee)	32,000
Butter	30,000
Khowa	112,000
Curd	140,000

Milk supply schemes have begun functioning at Srinagar and Jammu. The installation capacity per day is 10,000 literes of milk. During the Fifth Five Year Plan a number of milk plants will be set up to cover urban and some of the important and glorified rural centres along with a milk product factory.

POULTRY

Poultry stocks, however, have been calculated at 2.50 millions. There are about 100 poultry farms in the State mostly private owned. In recent years an intensive poultry development programme was launched at Srinagar near Hariparbat and Jammu near Belicharna. Marketing centres for poultry become increasingly important for quality and standard rates. At district level too, as it has begun in Baramulla and Kathua, poultry farming and marketing will improve production and sale.

The old method of keeping fowls and hens under cover during the night and of being allowed free movement during the day continues and adds to the encirclement of the diet and subsidiary income of the household.

PISCICULTURE

Kashmir abounds in waterways, springs, lakes, rivers, and streams which form considerable fishing grounds. Pisciculturists are of the view that Kashmir offers better opportunities for fishing than even Canada, New Zealand and Australia.

It was in the year 1901 that one Mr. Mitchel, whose name is associated with textiles in Kashmir, procured eyed ova for the first time. He got eyed ova of trout fish from Great Britain. It was at his initiative that a hatchery was started at Harwan in a stream near the Ardhawan Monastery. The eyed ova was distributed to many streams like the Madhumati, the Dachhigam Nala and many others. Thus was started the first hatchery by the Government of Jammu and Kashmir but this enterprise was taken up by the State. The ova was also spread in some of the important streams at different places, the location and extent of which are given below :

Locality	*Eyed ova spread*
Harwan	1,375,000
Achhabal	357,170
Sarbal	500
Kulgam	50,000
Isthel	50,000
Kotus	50,000
Ferozepur Nala	50,000

The ova are treated for three weeks with dried blood, powdered liver, eggs and powdered dry fish. Then the ova come to life.

The trout streams are about 482 km in length and trout thrives beyond 1,524 m above sea-level. There are some trout farms at Achhabal, Harwan, Laribal, Trikan and Papchan where trout fish is sold at controlled prices.

A recent advance in pisciculture is the introduction of mirror carp in the waterways of Kashmir. More than a lakh maunds have been produced and more than 3,000,000 maunds are the target.

SPECIES

There are more than 36 species of fish known within the States of Jammu, Kashmir and Ladakh, so far. Out of these about 30 are local. Brown trout, rainbow trout, mirror carp and scale carp have been introduced from outside. The *Mahaseer* also known as *parim gad* (fish) is also found in the river Jhelum during July, August and September. After September, it darts like an arrow back to the Punjab to enjoy warm water and in March when the temperature rises there, the *Mahaseer* moves up to cooler waters. The *Mahaseer* likes to swim at the confluence of cool and warm waters where there is greater scope for its sport.

FISHERFOLK : HABITAT AND ECONOMY

There are about 20,340 fisherfolk out of whom about 800 are engaged on the Wular Lake. The entire labour force for fishing is about 5,500 (1976-77). They cast their nets early at dawn and return in their small boats by noon. In the afternoon they dread a typical formation of cloud known as *Nagkon*. It is a type of elongated formation of the nimbus type of cloud which when it appears on the sky causes the wind to blow from the western direction resulting in a storm in the Wular lake. It has so much force that the wind lifts water on the sides exposing mud and silt at the bottom. Thus all the work of catching fish is completed before noon.

Middlemen carry fish to market. Boats, horses and *tongas* used to carry fish to Srinagar but now truck-loads of fish move in all directions from the Wular Lake.

The poor fisherfolk were illiterate and backward. They had no idea of market conditions. Conditions have become better than in the past when a system called *Wad* was in vogue. *Wad* means payment in advance at a nominal price for the catch of the fish to be made later. These semi-starving fisherfolk used to sell their catches in advance to the middlemen who provided them with maize, salt, kerosene oil, cloth, spices, grass mats, nets, cotton yarn, spears, utensils, willow baskets and oil. The middleman was, therefore, a necessary evil in the economy of these fisherfolk. Now cooperatives of fisherfolk have been formed and their membership has risen. The sale of fish by these co-operatives increased from 12,825 to 31,250 maunds of fish in the year 1961.

There are seasons for the catch af fish known to the fisherfolk as under :

Kind of fish	*Season of catch*
Charri gad	October-November
Sitar gad	All seasons
Rama gad	June
Tet gad	Shallow water after flood in August and September
Parim gad	November

In winter, small and big fish are caught and knived, then hung on ropes till these get frozen like icicles. It is then that flavour is acquired by the dry fish. This process of seasoning is known to the fisherfolk who also roast small-size fish in grass in order to blacken its skin. Such a fish is known as *Fir*. Women move with baskets full of such skin-burnt fish and sell it from house to house.

SCOPE

In recent years, supply of fish has increased and prices have come down from Rs. 1.25 to 75 paise per kg. Local production went up to about 72,236 quintals as shown below :

Production in Quintals—Year 1976-1977

Species	*Quantity*
Trout	78
Mirror Carp	45,973
Country fish	24,077
Jammu (fish)	2,108
Total	72,236

More than 5,000 families of fisherfolk are engaged in this subsidiary food industry. With research and experimentation in new species like splake, a hybrid of lake trout and brown trout, it is possible to use this industry to the advantage of these people. Suggestions for improvement of pisciculture are adopted for better yields.

Accumulation of silt and mud in streams is generally avoided by raising a screen of pebbles and boulders in the streams. It is plugged with grass, twigs and leaves. Over-crowding of fish in streams is avoided. Use of sterilization of ponds and tanks stave off diseases. Increased use of bleaching powder like chloride of lime, slaked lime, cloth and calcium hydroxide is becoming common. Erection of poles or plants in the centre of an infected pond enables fish to get rid of impurities on its body. Common salt is also added as it is supposed help fish in becoming healthy.

"The development of fisheries has been somewhat static during the last few years as solutions to the various problems of research are still being worked out. The problems of disease and workability in trout are serious matters to be dealt with." There is perhaps still no provision for research in pisciculture as seen in the physical targets for the Fifth plan.[1]

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[1] "Fifth Five Year Plan," pp. 111-112, Government of Jammu and Kashmir.

Chapter IX

IRRIGATION AND POWER RESOURCES

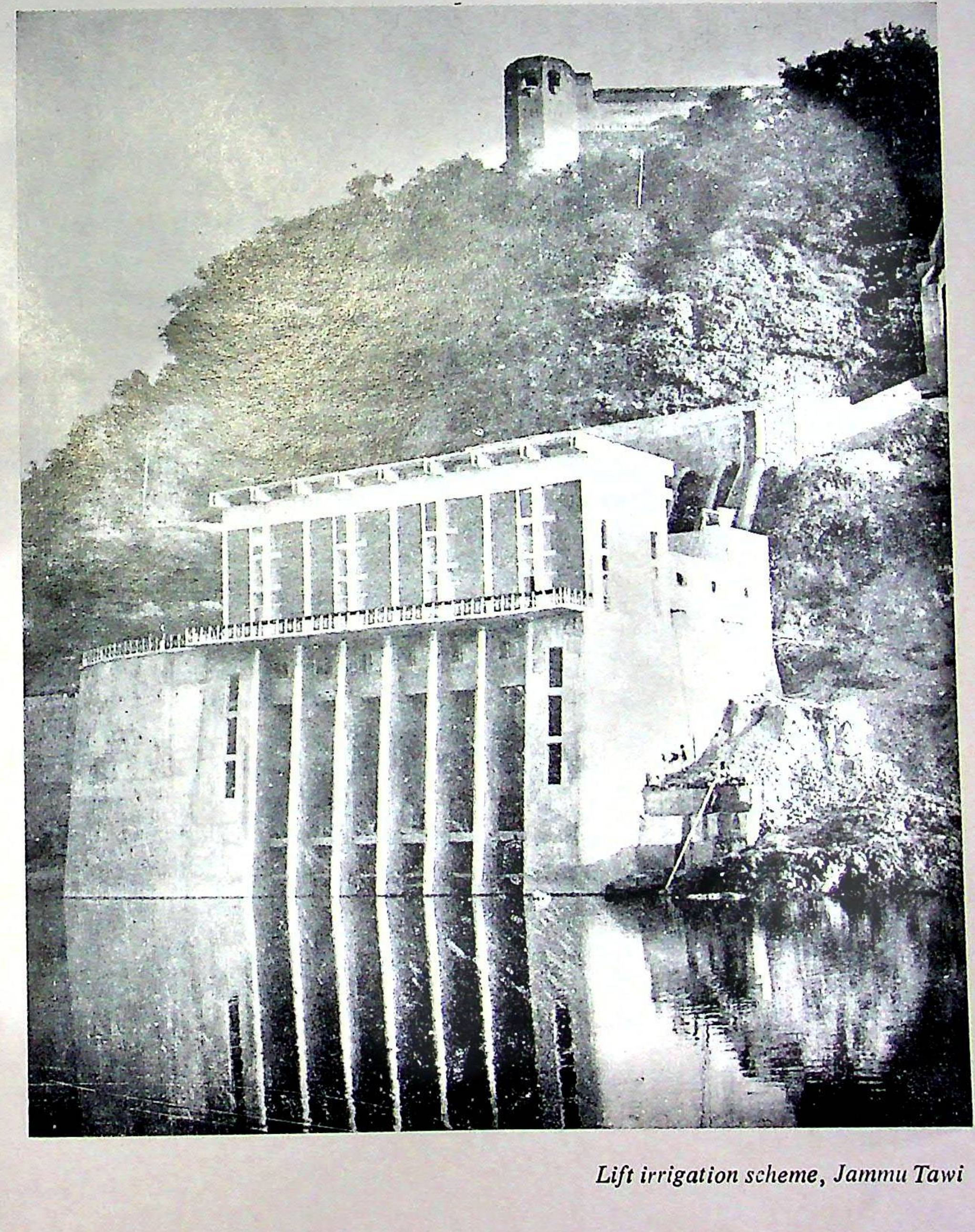
HISTORY

In Kashmir hydraulic operations are as old as the hills. The story of irrigation begins from the time of Prajāpatikashyapā who, according to the *Nilamat-Purana* and the *Rājatarangini*, was the first to use his miraculous power to cut the mountain ring of the valley at Baramulla and let the water flow out to lower elevations. This gigantic feat of divine engineering helped in reclaiming land from the bottom of the lake *Sati Sara* which was cultivated later. Thus the story dates back to even before the dawn of history.

The record of the ancient kings of Kashmir preserved by Kalhana Pandit shows how water was provided to the elevated karewas like the Samtara-Damodar, the present Srinagar aeroddrome. It signifies a huge construction programme to raise the water level and attempt a large-scale hydraulic operation. Legend thus merges into history.

The real story of how irrigation works began for the welfare of people is the work of Suyya, who got water from the Mahapadama Lake (now called Wular). Suyya is credited with an insight into prevention of flood calamity in the valley. His operations were well thought out and involved very little cost.

During the time of Lalitaditya, famine followed floods. Such was the effective power of Suyya that the people called him *Annapati*. lord of food. His study of the confluence of the Vitasta (Jhelum) and the Sindhu (Sind) was so thorough that he regulated the flow of water to these rivers to suit normal irrigation to agricultural lands. Judged by any standard, the success of Suyya was a miracle of that age, considering the crude type of facilities available then. Contemporary records also pay a glowing tribute to Suyya's genius. He will be remembered so long as the silt-town of Sopore remains on the map of Kashmir. Efforts continued later in the time of



Lift irrigation scheme, Jammu Tawi

Bakerwal engaged in sheep rearing

benevolent monarchs to follow the plans of Suyya.

Zain-ul-Abdin (A.D. 1417), a staunch friend of cultivators, pursued a programme of constructing canals, building bridges, raising dams and elevating river-banks. The wonderful experiments of joining waterfalls in dry streams leading to river enabled the conversion of dry land into smiling green gardens. His good idea of filling the Wular Lake and reclaiming land for cultivation was only put off by his death. He did much for the storage of water by digging a system of parallel canals on higher elevation to provide irrigation to the karewas.

Dogra rule witnessed devastating floods from 1893 to 1903. The valley of Kashmir was partly submerged in 1841 when the disaster brought ruin to the inhabitants. A serious problem arose for which drastic measures were necessary. Engineers suggested dredging, digging of new canals (*Kuhls*), planting of trees, erection of bunds and deepening of river to check floods. This did not prove of much use. The Summan Kuhl, the Nandi Kuhl, the Martand Kuhl, the Zaingir Kuhl, the Litapur Kuhl, the Lal Kuhl, and other *Kuhls* were opened and modelled to store water for irrigation.

As a matter of fact, it was Maharaja Ranbir Singh, who took keen interest in agriculture. In his time began a land survey of the entire State when a land revenue record was prepared with some exactitude. In fact, the cartographic work of the Revenue and Forest Departments began in his time. In 1877 when excessive rain ruined the crops, measures were taken to face food shortage and revise the land revenue policy of the State.

In the time of Maharaja Pratap Singh, real irrigation work under proper engineering supervision started. The dredging of the outfall channel from Sopore to Khadanyar was put into operation, reclaiming land in the Shahgund area near the Wular Lake. The Flood-Spill channel at Padshahi Bagh, Hokarsar, Naugam and the Dudganga *Nallahs* (canals) were completed with success. The Martand canal was remodelled and extended. The weir at Chhatabal (Srinagar) was built to regulate the water level in the entire city of Srinagar.

In the province of Jammu, the Ranbir Canal and the Pratap Canal were completed. The Basantpur Canal and the Ujh Canal were also completed in 1921 A.D.

The reign of Maharaja Hari Singh (1925-'47) witnessed devastating floods in 1928 and 1931. The Maharaja took keen interest in combating floods by constructing bridges, deepening canals and raising bunds. Vigorous engineering activity followed under his personal supervision. The strengthening of river-banks, building of lock-gates at Munshi Bagh and Gao Kadal helped in controlling the water-level in the city of Srinagar. The Dal lock-gates were also constructed along with new bridges above the flood level on the river Jhelum. Escape channels were constructed at Hokarsar, Anchar and Parimpora. The Dadi *Kuhl* was remodelled and the Zaingir Canal given a new shape. This was an effective programme of irrigation facilities approved by the Maharaja but it could not be put into action, for the political upheaval in the country in the mid-forties disturbed the then tempo of economic progress.

METHODS OF IRRIGATION FOLLOWED

In the territories of Jammu, Kashmir, Gilgit and Ladakh, the part played by irrigation is controlled by relief features. As the altitude rises, rushing torrents of water with melting ice in the higher elevations serve very little purpose for cultivation of land. The cultivable patches of alluvial land in the Middle Himalayas are small and scattered with no possibility of any major system of irrigation being undertaken.

In the Outer Plain and the Outer Hill region, however, the opening of the Ranbir Canal, the Pratap Canal, the Basantpur Canal, the Ujh Canal and the Upper Jhelum Canal resulted in irrigating the arid land known as the *Kandi*. The Ranbir Canal in particular extended over 400 km irrigating more then 127,071 acres of land. In the year 1947 after the partition, the Ranbir Canal suffered a shrinkage in its irrigated areas of 100,822 acres.

In the valley of Kashmir, the problem of irrigation is related to floods. Disastrous floods have a history dating from A.D. 879 when the slipping of the Khadanyar Mountain below Baramulla dammed the river Jhelum and a large part of the valley became submerged.

As an urban settlement, Srinagar remains a serious problem of engineering for all times. The entire history of Kashmir is dotted with floods as a result of continuous rains on the mountains where the ice melts and mountain streams flow down in rushing torrents till these join the river Jhelum. The Jhelum overflows its embankments. Many schemes have been proposed to combat floods in the valley, but the problem still poses a serious threat to the ever increasing acreage under cultivation. Life and property also suffer.

The devastating floods came again in 1950, 1953, 1954, 1956, 1957 and 1959. The discharges in the 1950 floods in the Jhelum are shown below :

Station	*Date*	*Time*	*Maximum gauge Metres*	*Velocity per second*	*Discharge in cusecs*
1. Khanabal	17.9.50	Noon	10.00	4.8167	33,700
2. Sangam	20.9.50	5 a.m.	9.	6.0452	67,300
3. Munshibagh	21.9.50	2 a.m.	7.6	5.4375	54,700
4. Shadipur	21.9.50	Noon	4.5	3.0692	31,500
5. Baramulla	23.9.50	Noon	5.1	3.2685	23,300

These natural calamities provided sufficient scope for a study by the hydraulic engineer, the pedologist and others. Samples of the bed material of the river Jhelum at various places, calculations of the hydraulic mean radius, sedimentation on the bed slope of the tributaries, study of the sand and gravel at the confluence of the rivers, the rate of sedimentation, the silt index of the outfall channels and preparation of sketches, maps and diagrams became available to the irrigation engineer whose problem it became to see that agricultural operations did not suffer for want of water and that surplus water was not allowed to cause damage.

FIVE YEAR PLANS

During the First Five-Year-Plan Rs. 1.70 crores were utilized on irrigation works. Remodelling of existing canals and *Kuhls* was taken up seriously. Dry farmlands came under irrigation as shown below:

1.	Dry farmlands irrigated by gravity canals	10,506 acres
2.	Dry farmlands irrigated by lift canals	4,978 "
3.	Remodelling of *Kuhls*	30,417 "
4.	Reclaimed lands	300 "

Lift canal irrigation helped in providing water to the western bank of the river Jhelum. Stations for lift irrigation were set up in the valley at Dogripora, Padgampore, Litapora. Aukhul, Delina, Barru and Ladura. A modest beginning, though it appeared, it was a promising feat of hydraulic engineering to which serious attention was given during the Second Five Year Plan. It has been calculated that 16,00,000 maunds of foodgrains were added to the total but the statistics could not be as certain since the Partition in the year 1947 had completely altered the position of acreage under irrigation particularly in the province of Jammu.

JAMMU PROVINCE

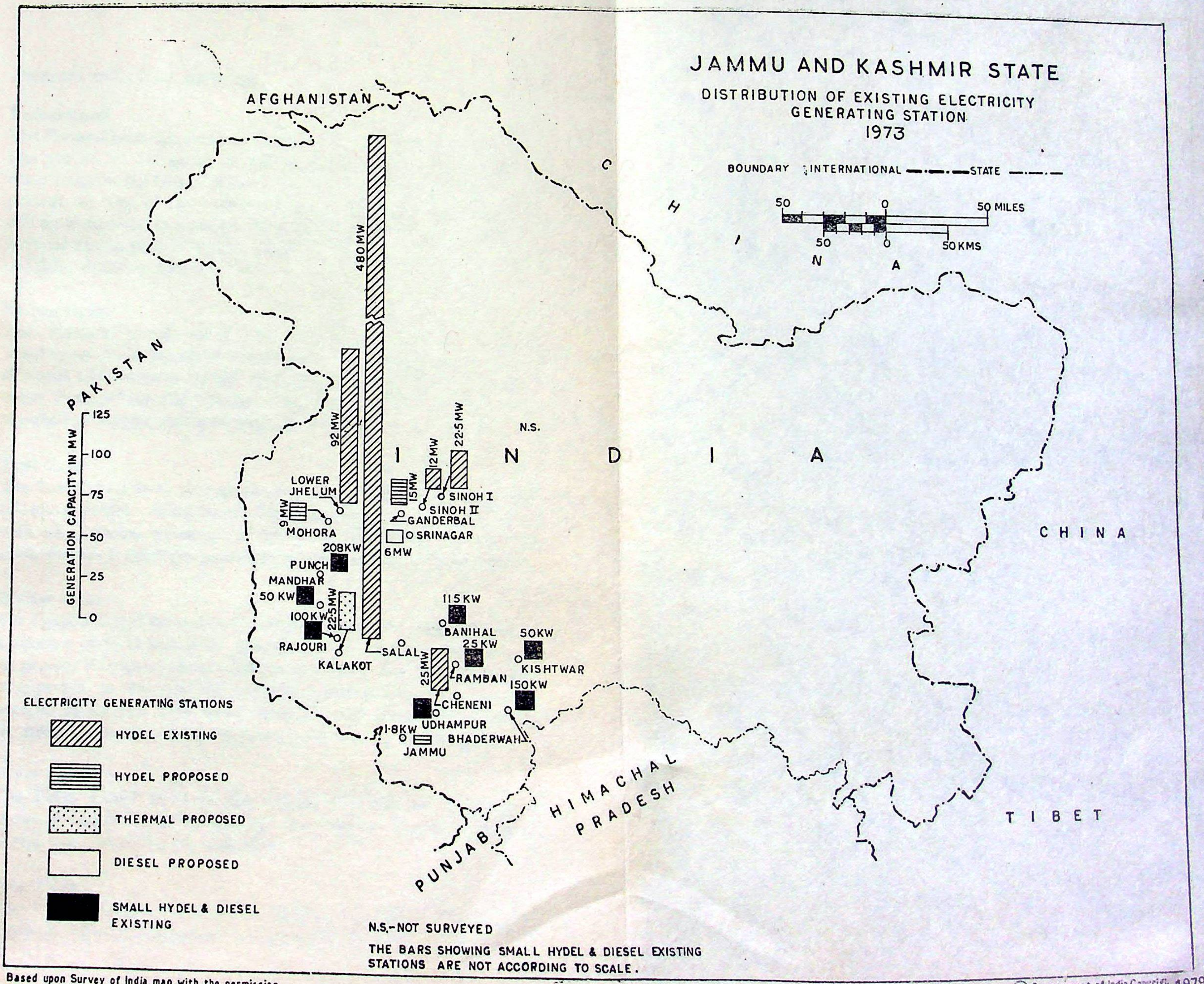
The Udhampur Canal was built at a cost of Rs. 6.11 lakhs to irrigate 2,400 acres of land under the First Five Year Plan. At present, it cannot irrigate more than 600 acres, as the frequent landslides on the mountains and the construction of the aerodrome have interrupted one of the tributaries of the canal.

The water supply project at Bhadrwah was completed under the First Five-Year Plan at a cost of Rs. 2.25 lakhs. Drinking water was thus made available to a population of 7,000.

Many flood protection bunds were raised at Jammu, Hiranagar, Kathua, Hamirpur, Pargoal, Chhamb and Ratnah Chak. More than 500 acres of land were reclaimed and about 30,000 persons protected from the ravages of floods. Besides the following canals were remodelled and minor irrigation schemes taken up:

Ranbir Canal

The Ranbir Canal takes its water from the river Chenab at Akhnoor. This canal irrigates the area of Kahuchak, Domana, Jammu and Ranbirsinghpora. The remodelling of the canal has been taken up and it is expected to irrigate an area of 1200 thousand hectares by the year 1980. At present more than 26,245 acres of land get water from this canal. A waterfall at the foot of the city of Jammu is also being harnessed for generating hydro-electricity. The water of the canal helps in irrigating the land and being cold it is an asset to the people in summer,



JAMMU AND KASHMIR STATE

DISTRIBUTION OF EXISTING ELECTRICITY GENERATING STATION

1973

ELECTRICITY GENERATING STATIONS

- ▨ HYDEL EXISTING
- ▤ HYDEL PROPOSED
- ⬚ THERMAL PROPOSED
- ☐ DIESEL PROPOSED
- ■ SMALL HYDEL & DIESEL EXISTING

N.S.-NOT SURVEYED

THE BARS SHOWING SMALL HYDEL & DIESEL EXISTING STATIONS ARE NOT ACCORDING TO SCALE.

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Map 7

Pratap Canal

The Pratap Canal takes its water from the river Chenab at Devipur. Devipur is to the south of Akhnoor at a distance of 95 kms. This canal irrigates the area of Khaur, Jaurian, Hamirpur and Sidhar. At present an area of 1,000 acres is irrigated by this canal but its remodelling is expected to increase the irrigation potential to 9.88 thousand hectares by the year 1980. More than 27 villages get water from this canal for drinking purposes.

Kathua Canal

The Kathua Canal takes its water from the river Ravi at Madhopore. In its length of 36 kms the canal irrigates an area of of about 3,000 acres to the left of the river Ujh and provides drinking water to more than 150 villages. The remodelling of this canal is expected to irrigate eleven thousand hectares by the year 1980.

Tawi Canal

The Tawi Canal flows near Udhampur and irrigates about 3,000 acres of land at present. Work on this lift project is in an advanced stage with an expected potential of 13.48 thousand hectares by the year 1980. Besides it generates electricity to the capacity of 8,000 kwts.

Dudhar Canal

The Dudhar Canal takes its water from the Dudhar *Nala* flowing at a distance of 13.12 kms from Jungalgali in the district of Udhampur. At present it irrigates about 3,000 acres of land but its remodelling is expected to increase the capacity for irrigation of 1.3 thousand hectares by the year 1980. Opening up of roads in the interior enables the twelve mile distance of the canal to be used by the villagers.

Payee Canal

The Payee Canal flows in the district of Riasi over a distance of about 10 kms from the Vaishnodevi near Zundra. The two branches of this canal irrigate land in Katrah.

Pargol Canal

The Pargol Canal lies between Akhnoor and Chhamb in Jammu province. The small island in the Chenab is also called Pargol.

Ujh Canal

The Ujh Canal takes its water from Jasrota and flows over a distance of about 71 kms irrigating land at Jasrota, Hiranagar and Samba.

Kishtwar Canal

The Kishtwar Canal was begun during the First Five Year Plan but with no satisfactory result. It was expected to irrigate the eastern part of Kishtwar known as Raigarh. The work has been taken up again.

Canals form an important system of irrigation in the Outer Plain and the valley of Kashmir. Digging is easy in the alluvial soil and water supply is perennial because of snow melting on higher altitudes throughout the year.

Recently the State Government started an extensive programme of digging wells as under:

Region	*Acres*
Jammu	219,778
Kashmir	486,072
Ladakh	3,945

Wells and tanks help irrigation in the Outer Plain at Ranbirsinghpora, Bishnah Samba, Hiranagar and Kathua. Tank irrigation is prevalent in Billawar (Jammu), Chrarisharif, Baripora, Hamal and Rajwara. In such arid areas, there, being no precipitation, the result is that the surface rock is scooped for storing water in depressions.

Tubewells are worked with electricity or other form of power. Water is lifted from great depths. There are about thirty pumping stations in Ranbirsinghpora, Hiranagar, Samba, Kathua, Guraslathian, Ramgarh and Rajauri. Besides supplying water in the *Kandi* (arid) areas these provide drinking water to the people.

LIFT IRRIGATION

Lift irrigation by pumping water is used for cultivation through canals. In Jammu province this type of irrigation is available at Saroor, Darhal, Chak and Batalbain. In Kashmir valley lift irrigation is in use at Padgampore, Lathipora, Ankhel, Dogripura, Achhabal, Ladru, Baramulla and Sonawari. Recently *dhingri* wells, 2 to 3 metres deep, supply water by level system to the fields. More than 6,000 *dhingri* wells are in use at present in the valley of Kashmir.

RIVER POOLS

River pools have been constructed in recent years near the banks of the rivers in those areas where land is cultivable. The extent of cultivation extended at Teetwal, Sopore, Uri, Kulgam, Pulwama, Ganderbal, Handwara and Anantnag in Kashmir province. In Jammu province cultivable land has been irrigated at Katrah, Basantpur, Rajauri and Punch.

The Jhelum river has an average monthly discharge at Baramulla as shown below beyond which the river is not navigable :

Average Monthly Discharge of the Jhelum at Baramulla—1973

Month	*Discharge (in cusecs)*	*% of the*	
		total discharge	*in June*
January	99,783	2.33	12.14
February	208,555	4.85	23.38
March	294,074	6.83	35.78
April	568,463	13.22	69.18
May	687,905	15.98	83.71
June	821,712	19.10	100.00
July	661,741	15.37	80.53
August	628,207	9.95	52.11
September	264,735	6.15	32.21
October	109,888	2.55	13.37
November	87,759	2.04	10.68
December	69,993	1.63	8.51
Total	4,502,815	100.00	

In the valley of Kashmir there are canals irrigating different areas where reservoirs have helped cultivation of land, generation of power and urbanization. The distribution of canals in the valley is given below :

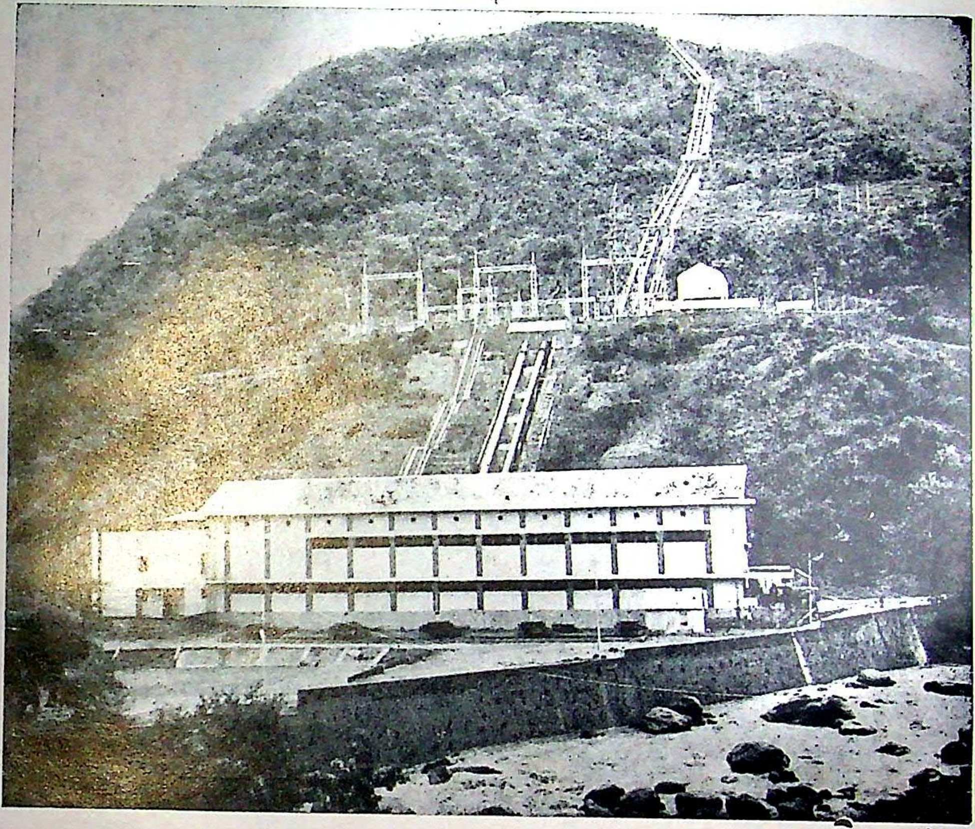
S. No.	Canals	Length in Kms	Area irrigated in acres
1.	Martand	50	9,500
2.	Shahkul	...	Manigam-Safapore
3.	Sharabkul	...	Chashmashahi
4.	Lalkul	3	7,500
5.	Zaingir	47	13,300
6.	Dadikul	19	8,000
7.	Nur	13	N.A.*
8.	Sumbal	35	5,000
9.	Zarkul		20,000
10.	Zainapur	32	6,000
11.	Nandi	30	8,000
12.	Parimpur	8	4,500
13.	Mahind	16	2,500
14.	Avantipur	36	5,000
15.	Kayal	50	5,500
16.	Rishipur	18	3,000
17.	Babul	22	4,500

*N. A.—Not Available

IRRIGATION AND LAND-USE

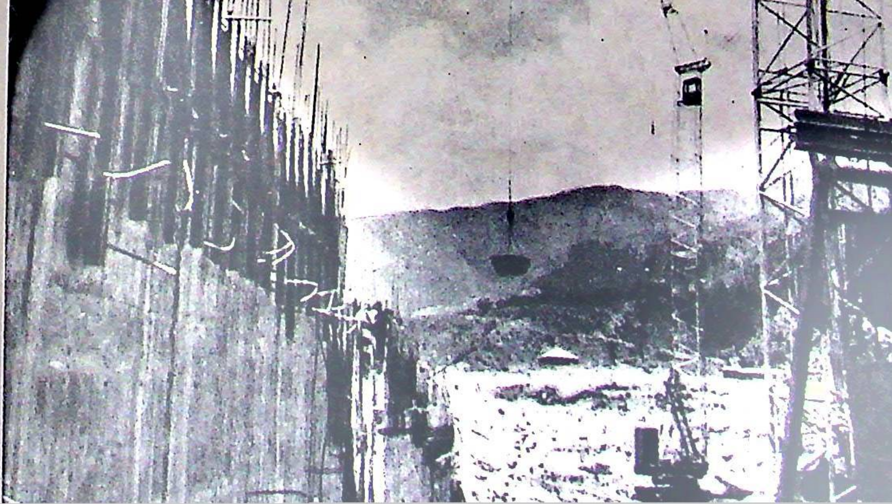
In the north the Madamati, the Dohnar, and Erin drain the area towards Bandipur. The pohru drains some area of Handwara and Sopore to the north east. The Romushi coming from Pakhapur joins the river Jhelum at 75° East longitude. It covers the areas of the *tahsils* of Badgam and Pulwama. The Vishav also drains the *tahsil* Kulgam a part of which along with some area of the *tahsil* of pulwama is drained by the Rambiara. The Lider drains the south and the eastern area of *tahsil* Anantnag. The Ferozepur *Nala* drains the western area of *tahsil* Baramulla. The Doodgang after draining some area of the Badgam *tahsil* joins the river Jhelum below Srinagar.

Over 465,122 acres of land are irrigated by the canals. The district of Anantnag constitutes 50 percent of this total. The irrigated area by wells is about 5,000 acres in the district of Srinagar whereas it is hardly 500 acres in the district of Anantnag and a 544 acres in the district of Baramulla. The net area sown thus, which is 486,072



Chenani Hydel Project, Jammu

Lower Jhelum Hydel Project



Prime Minister Smt. Indira Gandhi at an exhibition of art and culture acres in this region is free from any danger of drought as the melting of snow in summer provides water to the lower elevation. Besides relief of the small valley of its surrounding mountain enables a convenient supply of water to the elevated area.

The Plan period development from the year 1951 brought an additional increase of irrigation on 10 thousand acres in the year 1956. The district of Anantnag has 80 percent area under irrigation, 51.5 percent under non-irrigated land for rice. Oilseeds and maize claim 11.4 percent and 6.4 percent respectively. Maize, wheat, oilseeds and pulses are cultivated on non-irrigated land.

In the district of Srinagar wheat is mostly grown on non-irrigated areas. The lift irrigation scheme has brought western region of the Jhelum under cultivation since the year 1954 with the working of Padgampore lift canal, Dogripura lift canal, Barso lift canal, Delina lift canal, Ankhul lift canal and Letapur lift canal. This type of irrigation is used on the low slopes of the karewas also.

Large scale irrigation of Karewas is mentioned in the ancient annals of this land. The engineering miracles of Suyya who is credited with an insight into prevention of flood calamity in the valley are well known. Hydraulic operations have continued on a planned basis through historical time and measures of digging, dredging, planting of trees, erection of bunds and deepening of river beds have been taken up seriously. The entire scheme of opening *Kuhls* (streams) like the Zaingir, Nandi, Summan, Martand and Shahkul may be mentioned as some of the multipurpose measures in design and form.

LADAKH

The digging of canals in Ladakh is difficult. A very hard rock in a desert of thick sand cannot be easily dug. There being no silt in river water there is no check against seepage. Use of cement and concrete alone can check seepage. The Phiang irrigation channel has been remodelled and connected with a water storage tank. The Ranbirpora canal too has been partly remodelled.

In Nubra Valley an irrigation channel has been constructed in village Warris. The Biagdangdoo channel is also complete now. The Thersha channel in the Chushul Valley irrigates the newly reclaimed land in the area.

POWER RESOURCES

The chief source of all power is the sun, whose energy is stored in wood and fossil fuels. Coal, oil, natural gas and waterfalls provide power for the use of man. Wind is also regarded as a source of power. On a coastal strip 30.4 m wide a wave rising two feet three times a minute exerts a force of 6, 000 horsepower per mile. Around the area of volcanic energy earth-heat is also regarded as a source of power evidenced by hot springs but its use is limited to Italy and California. All other sources of power fall into insignificance besides the great source of power. The direct rays of the sun calculated to hurl into 2,331 sq. km of Egypt enough power to replace all the engines and water wheels in the world. Alcohol can also be used as a substitute for gasoline and kerosene as in Germany. Since alcohol depends on agriculture, its source is inexhaustible.

Water power has loomed large in the last sixty years because of the solid cement dams and ease of carrying water to the site of the generators with little difficulty. Power thus generated can be transmitted hundreds of miles away to places where raw material and labour are available. Control over water power has made possible the functioning of many engineering plants.

In a mountainous country like the State of Jammu and Kashmir with thick forests, wood will remain a source of power for a long time to come. Far away from the coal-mining areas, so far the use of wood and dried dung-cakes continues to be the source of domestic fuel. Strained Anglo-Russian relations forced the British to strengthen the then frontiers of India in the north. It was in the beginning of the twentieth century that the British designed a 25-cycle per second plant of 4,000 kilowatts at Mohra, eight miles from Baramulla in Kashmir.

The Anglo-Russian relations in the north of the Valley of Kashmir then improved and electricity thus generated was used for domestic consumption and for running some factories. With the advance of technology, motors, radios, surgical instruments, electrical goods and other power appliances were used and 25-cycle electricity was found wanting in their working. However, with the generation of electricity at other places, the power generated at Mohra was exclusively used for rice-husking mills, wheat-grinding mills, and the silk factory at Srinagar. The silk weaving factory at Srinagar also used this power. In this respect, the valley of Kashmir comes almost first in the history of electrification in the country. Conversion from 25-to 50-cycle machinery costing about Rs. 2,00,00,000 was set up to add 6,000 kilowatts to the existing capacity bringing it to 15,000 kilowatts.

THE SIND VALLEY HYDRO-ELECTRIC PROJECT

There are many power plants in Kashmir province. This project for generating white coal or electric power is near Ganderbal on the bank of the river Sind towards its east. A canal eight miles long rises upwards and generates 13,000 kilowatts of power from 1955. Its completion gave relief to the Mohra power plant which could then cater to the needs of industrial concerns. The city of Srinagar and its suburbs mostly to the north got cheap electricity produced at 50 cycles. The project was to some extent a multi-purpose one. The electricity of the Sind plant has extended 56 km south of Srinagar towards Anantnag and supplied power to the lift irrigation scheme as well.

THE PAHALGAM PROJECT

The river Lidar is an important tributary of the river Jhelum. It has been harnessed for water power at Pahalgam. In the beginning a dam 25 feet high created a waterfall, generating 200 kilowatts of electricity. This power helps in lighting huts for the comfort of tourists. During winter electricity helps tourism. In rural areas in this river valley cottage industries will also make use of this power.

The raising of the right bank of the river Jhelum to the west is an ambitious project. Aridity retards cultivation in this area and when there are floods, devastation to the western side of the river Jhelum is complete. Lift irrigation pumps when worked could definitely provide agricultural employment to more than 700,000 peasants who could also use cheap power for cottage products as well.

JAMMU PROVINCE

In the province of Jammu the problem of generating electricity is complex. The earliest attempt is that of utilizing the Ranbir Canal for installing a hydroelectric power plant with a maximum capacity of

600 kilowatts from a fall of 26 feet from the river Chenab. For purposes of drinking water is pumped to the city of Jammu. Electricity generated from the waterfall is not sufficient, therefore, diesel-oil engine-generators are used. This is necessary as the power supply is insufficient. Besides, electricity is in demand more and more in view of the speedy industrialization in the province of Jammu and its consumption in the city of Jammu in particular. The ever-increasing demand for flour mills, the Drug Research Laboratory, the Jammu Silk Factory and many other small concerns for which hydro-electric power is required also need it.

When India was undivided many gigantic schemes for generating electricity were planned. One of these was the Ramban-Riasi-Chenab project which should have been a wonder in the world. A dam 225m high at Riasi would raise the water level of the river Chenab, thus making it navigable till Ramban and allowing heavy boats and even sea craft to move up and down. Besides it would be a rich ground for fisheries. Electricity thus generated to the tune of 520,000 kilowatts could be made available. Arid Punjab at present irrigated by the Chenab would come under the plough and add to its food production. The renowed boulder-dam expert of the world, S.L. Savages, completed this plan in outline at a cost of rupees 45,000. The plan could not be taken up in hand as the division of the Punjab consequent on the Partition of India created many difficulties.

Many projects are, however, under execution or consideration and it is expected that the Chenani Power Plant will be commissioned before the Salal Project is completed.

LADAKH : POWER RESOURCES

The Central Water and Power Commission of the Government of India has a scheme ready for generating 1,500 kilowatts of power at Kargil and Leh. The Chinese invasion in the year 1962 hampered progress, but as an emergency measure a diesel engine at Leh and another at Kargil were set up at a cost of Rs. 1,00,000 to produce electricity.

The State of Jammu and Kashmir has a sound position for generating hydel power in the Northern Zone. The development in generating electricity has been as follows :

Year	*Power in MWs*
1947	4
1971	47.35*

*This includes 7 MW generated at Kalakote. The Punjab Government supplies 10.66 MWs which is not included in the above.

POWER DEVELOPMENT PLANS

Power development is a must for an all round economic and industrial growth of the State. The State Government have taken a number of steps in recent years to develop power potential. The total generating capacity in the State on the eve of Independence was about 4 MWs. This was augmented by 11.20 MWs and 21.32 MWs during the second and third Five Year Plans respectively bringing the total capacity to 36.52 MWs. In 1971 40.75 MWs of power including 7.5 MWs from Kalakote are being generated in the State while 10.66 MWs are being purchased from the Punjab Government.

The Ganderbal Hydel Project which was taken up in two phases has an installed capacity of 15 MWs. The first phase was completed in 1956 at a cost of about Rs. 248 lakhs. Work on the second phase, on which an expenditure of Rs. 105 lakhs was incurred, was completed in 1961.

The machinery of the old Mohara Power House which was worn out and out-dated was replaced and power house renovated and modernized. The new power house, which was commissioned in October 1962 made available 9 MWs of electricity and was completed at a cost of Rs. 198 lakhs.

A few other minor hydel stations were installed during the Third Plan period having a total capacity of generating 3 MWs of power.

For increasing the existing power supply and to provide electricity to regions where hydel or thermal projects could not be put up, several diesel generating sets have been installed. The installed capacity of these sets is 5.66 MWs and the biggest of these diesel power generating stations, which alone accounts for 5,000 KWs of electricity, was commissioned in November 1967 at Bemina (Srinagar) at a cost of Rs. 75.06 lakhs.

For meeting the requirements of the Jammu region, the Government purchases about 10 MWs of power from Punjab. Efforts are also being made for utilising the available thermal potential of Kalakote region in the Jammu Province. A Thermal Station has been commissioned there and its first unit is generating 7.5 MWs. The capacity of this project is expected to rise further by 15 MWs.

In pursuance of its policy to provide electricity to the remotest corners of the State, the Government have been taking measures for expansion of electricity in rural areas.

Rural Electrification Programme has been intensified in the recent years and more than 725 villages were provided with electric power up to end of March 1969. This was high above the national average of rural electrification on a percentage basis.

Ladakh has also entered the age of electricity. Leh and Kargil towns have for the first time been electrified during the Third Plan.

The bill for setting up the State Electricity Board has been passed recently by the Legislative Assembly of the State.

Notwithstanding the measures listed above, there is still much headway to be made in the matter of expansion of electricity. The State has fortunately in its perennial waterways a source which can feed huge hydroelectric projects and thereby meet adequately its entire requirements of power supply.

The State Government is well aware of this advantage and has taken steps to tap these vast resources to the full. At present several major projects are in progress and over Rs. 57.50 crores are estimated to be spent on the completion of these projects. These include the Chenani Hydel Project, with an installed capacity of 24 MWs, the Upper Sindh Project (Kangan) with an installed capacity of 22MWs and the Lower Jhelum Hydel Project (Sheri) having an installed capacity of 96 MWs of power. The first phase of the Rs. 9 crore Chenani Project has been completed.

The Upper Sindh Hydel Project was completed in the year 1972-'73 at an estimated cost of Rs. 8.85 crores. On completion this project is likely to cost Rs. 35 crores. With the completion of all the projects in hand at present, the power position in Jammu and Kashmir will considerably improve the installed capacity swelling to about 200 MWs of electricity.

However, the greatest landmark in the history of the power development in the State is the initiation of work on the Salal Hydel Project in Jammu region. This project, because of its enormous size and the heavy expenditure involved, has been taken over by the Central Government. With its completion not only the requirements of the State in respect of power supply would be met, but also sufficient power would be available for export to the neighbouring States. The project is being taken up in two phases. In the first phase it will generate 270 MWs and its cost will be Rs. 55 crores. The second phase will be taken up soon afterwards and with its commissioning the totalcapacity of the project will rise up to 340 MWs.

The installed capacity of power stations is at an increase and the position to the close of the Fifth Five year plan is expected as under :

Installed Capacity of Power Stations in Jammu and Kashmir

District	*Source*	*Units in MW*
I. *Ganderbal*	Hydro	15
a Upper Sind Hydel Project	Hydro	22
b Bemina	Diesel	5
II. *Baramulla*		
a Mohra	Hydel	9
b Kanzalwani	Diesel	
c Dawar	,,	
d Tangdar	,,	
III. *Anantnag*	Diesel	1060
IV. *Ladakh*		
a Leh	Diesel	0.438
b Kargil	Hydel	0.475
c Nurla	,,	0.003
V. *Jammu*		
Canal Power House	Hydel	1.00
Udhampur	Hydro	0.64
Chenani Project	Hydro	25.00
VI. *Doda*		
a Bhadrwah		0.56
b Doba		
c Kishtwar		
VII. *Rajauri*		
Poonch Kalakote Thermal Stations		22.50
Total		105.476

Along with the generation of more power the task of transmission and power distribution of the available power supply is also very important. In this connection the Government plans to carry power to the far flung areas of the State and also to connect the system of transmission lines with the Northern Grid. To achieve this a 132-KV transmission line between Srinagar and Chenani and vice versa is being laid at a cost of Rs. 2.00 crores. Another 220 KV transmission line from Pathankot to Jammu is going to be laid at a cost of Rs. 200 crores. These two transmission lines will constitute the life artery of power distribution in Jammu and Kashmir. In addition, a 33 KV transmission line from Tangmarg to Gulmarg and a 66 KV transmission line from Pathankot to Jammu have been completed. Work on a 33 KV transmission line is on from Doda to Kishtwar, 11 KV line from Qazigund to Banihal and a 33 KV line from Patta to Tangmarg.

Chapter X

MINERAL RESOURCES

IMPORTANCE AND DISTRIBUTION

Kashmir is known for its superb climate and charming scenery. The mountains surrounding the valley of Kashmir are shimmering with snow and present a grand panorama to the eye. These mountains have varied mineral wealth which has great use for the arts, crafts and manufactures of this part of India.

In all the physiographic divisions of the territories of Jammu, Kashmir, Ladakh and Gilgit, geologists have conducted surveys in the past. The names of Middlemiss, Wadia any many others may be mentioned along with those who worked on behalf of the Geological Survey of India and prepared outline reports about the possibility of mineral wealth in areas surveyed by them.

The Jammu and Kashmir Government, however, established a Mineral Survey Department of its own under Middlemiss, a retired Superintendent of the Geological Survey of India. A beginning was made and preliminary work was started and survey reports published in the form of bulletins on different mineral deposits in the territories of the State. Spade-work was also conducted by some tourists, travellers and field scientists who visited this land during the early years of the present century.

An intensive mineral survey was taken up in the year 1956 when systematic investigation began. It formed part of the general mineral survey taken up by the Government of India in its programme of planned development for the mineral exploitation in the State. A summary distribution of these minerals is given in the map.

CATEGORIES

There are four categories of minerals in the State as shown on the next page:

Categories of Minerals

(1) Commercially exploitable

Mineral	*Location*
1. Coal	Jammu
2. Lignite	Kashmir
3. Limestone	Jammu and Kashmir
4. Gypsum	Jammu and Kashmir
5. Cement clays	Kashmir
6. Bauxite	Jammu
7. Graphite	Kashmir

(2) Not properly surveyed but commercially exploitable

1. Lead and Lime Ores	Jammu and Kashmir
2. Nickel Ore	Jammu
3. Bentonite	Jammu
4. Arsenic Ore	Kashmir
5. Slate	Kashmir
6. Kaolin	Jammu
7. Oil and natural gas	Jammu
8. Borax	Ladakh

(3) Sizeable but not accessible

1. Chromite	Ladakh
2. Precious stones sapphire	Kishtwar (Padar)
3. Gold	Ladakh

(4) Significant

1. Iron Ore	Jammu (in Shale bands)
2. Barytes	Jammu
3. Soap stone	Jammu
4. Copper	Kashmir
5. Radioactive Minerals	Jammu

PRECIOUS AND SEMI-PRECIOUS STONES

Precious and semi-precious stones are known for their durability, variety and beauty. Found in Padar (*tahsil* Kishtwar in Jammu province) two and a half miles to the west-northwest of Surujam at an elevation of 4,572 m to 8,229 m above sea level and hidden high at an elevation of about 4267 m above sea-level, corundum, a mineral consisting of alumina, or oxide of aluminium (Al_2O_3) is obtained from the talus-debris. Gem stones of hypogeous origin developed by hydrothermal processes from magmas or rock-melts are found with igneous intrusive masses and metamorphosed crystalline schists. The area requires detailed investigation to reveal the existence of the ruby, as true deep-coloured rubies have been found in this area. A process of careful working of veins and then following them up into depth would be expected to reveal a rich crop of rubies.

In an undulating upland valley where snow covers the landscape for more than seven months, the working period in Padar is too short. Corundum of pigeon's blood-colour is found here. It has a perfect lustre. In 1928, 5,500 tolas were obtained from the washing of deposits but the work had to be given up for difficulties of transport and hostile climatic conditions making permanent settlement difficult at a height above 4,419.6 m.

On Moah's scale the hardness of corundum was found to be even and, therefore, the precious stone was pleasing and transparent. Attempts were made from time to time but perfect gems were not found except a sufficient store of "rock sapphires" now used as abrasives and watch jewels.

AQUAMARINE AND BERYL

The gem form of aquamarine and beryl were first obtained from Dras on the river Braldu in Baltistan. Braldu is at Latitude 35° 43′ North and Longitude 75° 31′ East. Recently, Dasu mines in Skardu have been worked sporadically. The crystals are light-blue in colour and the limpidity is fine. Aquamarine is also found at Dangel, Chishote and Kohan in Padar *tahsil*, Kishtwar and Karnah (Kashmir).

SERPENTINE

The serpentine deposits are of many varieties. These are scattered over the higher mountains. Far away to the north of Shigar is found the apple-green serpentine of which tea-pots, glasses and cigarette-holders are made.

ROCK CRYSTAL AND FELSPAR

Rock crystal and felspar are dark smoky in colour. These are found near Padar in Kishtwar. These are used for buttons, ear-drops and gems. Extensive use is made of these crystals in controlling the waves emitted from broadcasting stations.

ABRASIVES

Polishing material has been found at Khunmuh near Srinagar. It is the gangamopteria or shale of the Permian age which has yielded this polishing material. When this material is powdered to various degrees of finenes, this abrasive becomes milder and milder. Used now in polishing metals, marble and cement-flooring, its demand is fast increasing. Recently the estimate of deposits was made at 1,164,450 cft. Properly treated, this material can compete with a well-known polishing material now in the market.

QUARTZ

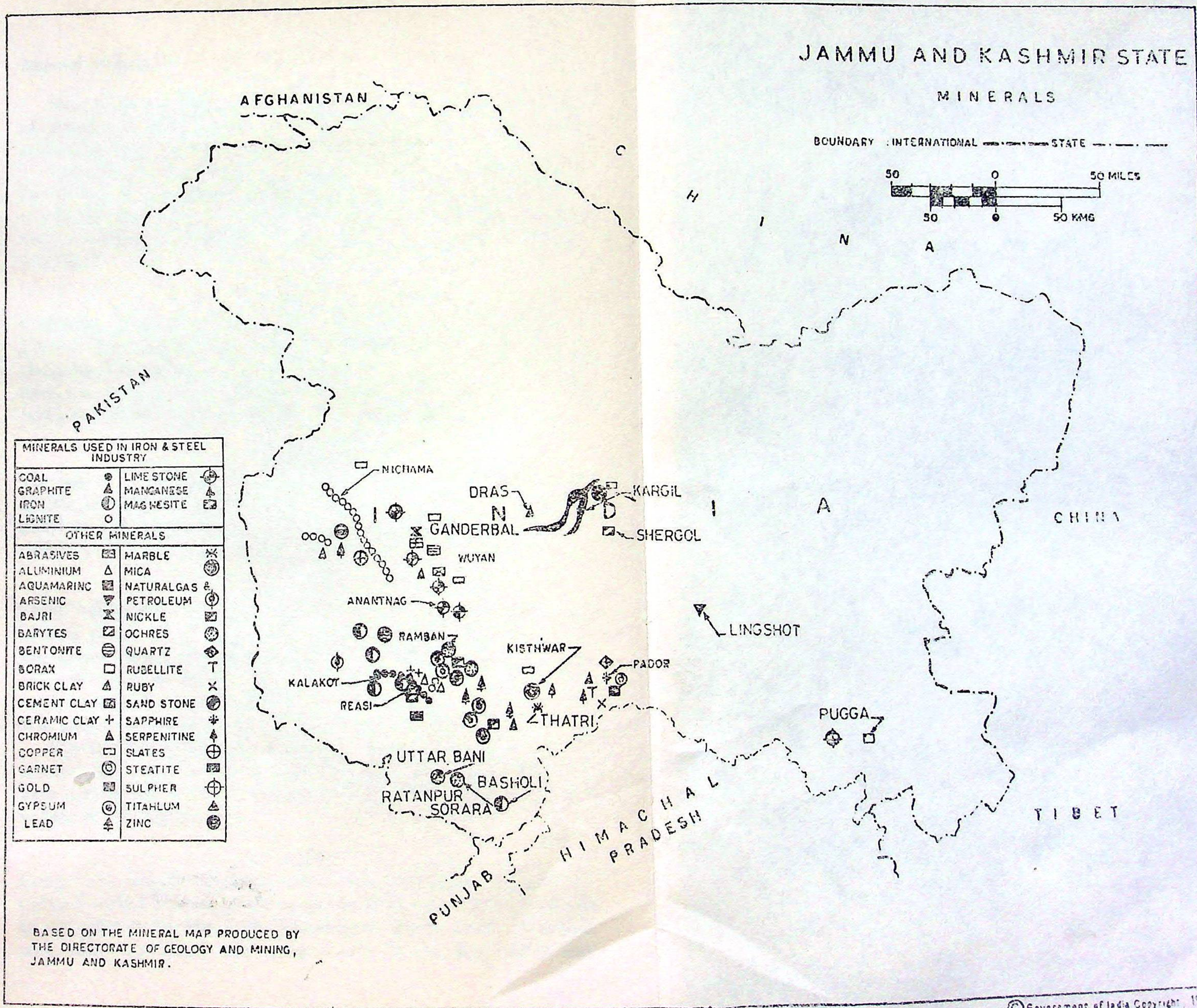
Quartz is found in the Padar area. The quartz crystals are reported to be piezoelectric. These have been found at Sonamarg and Karnah in Kashmir. Detailed investigation in quartz in necessary.

GYPSUM

Gypsum is the cheapest mineral product found in India. It is used for the surface dressing of agricultural land and for making plaster of paris. Extensive deposits of gypsum were found at Ramban, Batote and Assar in the province of Jammu.

The province of Kashmir has gypsum near Uri beyond Baramulla. Gypsum deposits have also been found near Lachhipura and Baramulla. The material is carried in boats for use in the city of Srinagar and its suburbs. Recent surveys in gypsum were conducted by the Geological Survey of India. These revealed a total reserve of about 22,00,000 tons of gypsum. It is stated to be of a good quality.

The deposits in the province of Jammu are found at Assar to the south of the river Chenab near Doda. These are reported to be also of a good quality.



Based upon Survey of India map with the permission of the Surveyor General of India

Map 8

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Near Anantnag in Kashmir the recent survey has put the estimates of gypsum at 15,000,000 tons. On experimentation the gypsum content has been found to be 91.75 percent.

Graphite occurs associated with gypsum and is found in some part of Uri. It can withstand high temperatures. An annual production of 0.04 thousand tons is extracted at present. A thorough survey reveals reserves of gypsum at many other places in Jammu and Kashmir.

CLAYS

China-clay (kaolin) is found widely distributed in the province of Jammu. The deposits are worked at Chekker Tikri and Salal (Jangalgali). An enormous quantity of this clay is available and is used for white washing by the people of Jammu. This clay is used in pottery-making and as a substitute in many other products.

BENTONITE

The deposits of bentonite are spread between Bhimber and Kathua in the province of Jammu. The thickness varies from several millimetres to several metres. These deposits lie on the gentle dipping slopes of the Siwalik conglomerates in the Outer Plain of Jammu.

FULLER'S EARTH

Fuller's-earth was first seen in 1923. Since then it has been used in making soap. It is a diluent. It is used in the manufacture of anti-phlogestine. It is a retarder and is also used for filling paper. As an absorptive and decoloriser this clay is peculiarly suitable. Fuller's earth is found at Rampur near Baramulla in the province of Kashmir. It is found near Rajauri and Budil in the province of Jammu.

The use of this mineral is extending more for its physical characteristics than for its chemical constituents. Its colour may vary from light grey to light brown. These colours are generally liked for their yellowish hue when dry.

COPPER

Copper ores include sulphides, oxides and carbonates. These occur in the Shumhar area of Anantnag district in the province of Kashmir. In the valley of the river Lidar impersistent quartz veins, associated with lead ores occur. The Kangan area in the Sind valley near

Ganderbal has also sulphides and carbonates of copper and iron with some oxides. Carbonates and arsenides also occur on the Lashteal hill spurs in the district of Baramulla. In the area drained by the river Chenab, there are some places where copper ore has been found towards Jangalgali. Prospecting is still on for copper deposits in the district of Doda and other areas which merit further exploration.

GOLD

Gold is found in quartz veins. It gets liberated due to the action of wind, rain and chemical change. Particles of gold get concentrated in rivers and streams as placer deposits. In the Kargil area along the terraces of the river Indus, sporadic gold placers have been recorded. It is estimated that 0.57 tola of gold can be obtained per cubic metre of gravel. Even platinum has been traced in the gold washings.

BAUXITE

Bauxite deposits are widespread in the province of Jammu. These deposits were first worked in the year 1919. Rich deposits are found in Chakkar (Riasi) near Sangarmark, Panhasa, Sala, Jangalgali and Sukhwalgali. These stations lie to the east of Riasi (Longitude 74° 33′ East and Latitude 33° North). In recent surveys sufficient quantities of bauxite and aluminium have been discovered in association with numulitic limestone of Eocene times in Jammu and Punch. About 40,000 tons of metallic aluminium is produced at present. India imports over 15,000 tons of metallic aluminium a year.

NICKEL

Nickel does and occur free in nature. It is a soft white metal beaten into any shape. Impregnations of nickeliferous iron sulphides and arsenides have been discovered in the vicinity of Ramsu in an area of about three miles by two hundred yards. Surface investigation has revealed the possibility of a workable zone at greater depths. Nickel is widely used now as an alloy. With zinc and copper, "German silver" is obtained. Niekel steel is now used in the manufacture of armour-plate and motorcars. For hardening of fats and oils, metallic nickel is used as a catalyst in Vanaspati.

ZINC

Zinc does not occur free in nature. It occurs as a sulphide known as sphalerite. Zinc sulphide is found in the lime-stones of Darabi area in the district of Udhampur. It is alloyed wlth copper to form an alloy known as brass. Utensils of brass are still very common. Zinc is also used in the manufacture of tubes containing tooth paste and the like.

LEAD

Lead is soft but heavy. The use of lead as a metal is increasing. Lead pipes are used in bath-rooms, laboratories and as type metal in the printing industry. It is also used as a friction metal, being extremely soft. Its use is spreading in car batteries, lead sheeting, cable covers, ammunition, glass-making, rubber industry; lead oxide paint to avoid rusting; lead nitrate in calico dyeing and for many other purposes. The use of lead is increasing day by day.

Lead (or galens) was known to occur in the Buniyar near Baramulla in the valley of Kashmir. Quartz veins are also found in the district of Baramulla and as stringers in the Salkhala metal sediments. Disseminations and veins of galena occur around Nigote in the district of Udhampur where both sphalerite and the sulphide of zinc and galena occur together.

MINOR MINERALS

Of the minor minerals Barytes occurs near Jangalgali in pocket deposits. It is used in paints but cheap material from Madras retards its exploitation.

Soapstone is found near Katra and Panthal. Though of an inferior quality it is used in cheap quality of paint.

Ochre is found near Banihal and Ratasar in Kashmir valley. Being a powdery material it is used for decorating walls and doors, paints and plaster. Recently ochre was found near Uri and Nur Khawh where the reserves are estimated at 200,000 tons.

IRON ORE

The bridge over the river Chandrabhaga (the Chenab) at Ramban on the Jammu-Srinagar Road is made of iron ore mined at Chakkar and Salal. There are innumerable pits seen in this limestone region where forests provide fuel for furnaces. Some fairly rich deposits of iron ore with 50 percent of iron have been found from time to time but no systematic survey has been attampted so far to ensure investment on a commercial basis. Middlemiss saw certain areas of occurrence of iron ore with a thickness of about 4 m at Khandi and Puani.

Almost every year yield in minerals is reported and its increase determined compared to the output of previous years. The figures of production for the year 1960 are given below for some of the important minerals.

Annual Production of Minerals (1960)

Gypsum	0.04 thousand maunds
China-clay	600 maunds
Fireclay	1155 maunds
Bentonite	40 tons
Quartz	222 maunds
Sapphire	0.05 lakh tolas
Galena	20 tons
Borax	24 maunds
Iron sulphate	20 maunds

COAL

In the valley of Kashmir, coal of inferior quality was estimated at 20 million tons in the Nichahoma area. Adequate quarriable reserves per annum have been estimated at about 200,000 tons. The Indian Bureau of Mines has proved a workable vicinity of 4 million tons so far.

An area extending over 56 km through Ladda, Chinkah, Dhansal, Chakan, Mahogala, Mesks and Kalakot has coal seams to a depth of about 30 m from the surface. Coal seams of the Eocene age crop out around the great limestone region with characteristic faults and thrusts greatly distorted. Such a formation of structure creates difficulties in mining operations. Midlicot and Simpson made a surface survey but indications were of the existence of a lower horizon in the area concealed by overlapping.

The coal in both the horizons is of good quality. It is low volatile with 17 percent ash, 1 percent sulphur and a calorific value of the order of 120,000 to 130,000 B.T.U./1b.

The oil-bearing tectonic axis at Khaur and Dhulion found in the domes of Western Pakistan extends also towards Kotli Nowshera, Saruinsar and Mansar. The axis extends across the river Ravi into the Jwalamukhi area. Many years ago an oil seepage was reported at Maradpur near Rajauri. On field examination, it was found to be a natural seepage of which geological mapping was prepared. In the Mansar and Ramnagar area, preliminary investigation has revealed some areas of inflammable gas of which an estimate was prepared by the Oil and Natural Gas Commission of the Government of India.

LIGNITE

The middle Karewas in the valley of Kashmir are notable for their reserves of lignite. Lignite was known to exist long before Middlemiss wrote his account in the year 1924.

His account covered a small area near Nichahom (34° 23′ North Latitude and 74° 9′ East Longitude) in the district of Baramulla. The Geological Survey of India took up the work of investigation in the year 1955. An outline survey was ready in the year 1958. It covered the area between Shaliganga, Ferozepur Nala, Nagbal, Tungmarg, Baramulla, Handwara, Nichahom and Chowkibal. The estimated reserves of lignite were placed at about 84 million tons.

Drilling operations started first in the Nichahom-Chowkibal area where the reserve were estimated at 4.5 million tons up to a depth of 38 m. This lignite was stated to be of a poor quality with ash from 25 to 50 percent and moisture from 20 to 35 percent and a calorific value from 2,200 to 4,500 B.T.U./lb. The calorific value of this coal varies from 8,500-14,700 B.T.Us. The upper measure coal is powdery. The lower measure, which is found at Kalakot, is hard and lumpy like Bengal coal. Jangalgali coal is soft and powdery, but important because of its proximity to Jammu. Jangalgali, Kalakot and Kotli deposit areas are being exploited and during actual mining operations it has been found that, as a rule, the coal seams do appear in the form of lenses, pinching and turning out at short intervals besides being heavily faulted and foiled, resulting in rapid and erratic variations in dip. This has necessitated more detailed and accurate geological investigation and a reappraisal of coal reserves. As a result of this reappraisal G.S.I. has estimated 7.14 million tons of coal reserves in Bergao.

FUEL PROBLEM

Fuel, as is well known, is the backbone of any sound economy. It plays the main role in building up of civilization. In Kashmir where winter reigns supreme and the temperature goes even below—6° C in winter months. Thus fuel comes before food. As such, the common search has always been for this or that kind of fuel.

It was actually the field surveys by geologists that revealed some lignite and anthracite deposits in the State of Jammu and Kashmir. Further study of these fuel resources was not attempted seriously till the Second Five Year Plant when attention was focussed on systematic and detailed regional investigation. The virgin areas were surveyed and reports of the distribution of lignite prepared. Then the mines at Kalakote (Jammu province) and Nichahom (Kashmir province) began to be worked.

C.S. Middlemiss in his published report in the year 1930 had estimated about 128 million tons of lignite in Nichahom and Raithan (Shaligana). The intervening distance of about 80 km was recently surveyed by the Geological Survey of India as a result of investigations by Middlemiss. About 700 million tons of lignite are reported to be available and need exploitation. But for large scale mining of coal, it is necessary to have sample projects to get a clear idea of the working of mines on a commercial scale. The following percentages were recorded when a sample from this area was experimented with when air-dried:

Moisture	8-12%
Ash	33-40%
Volatile matter	30-35%
Fixed carbon	12-20%

The calorific value varies from 4500 to 5500 B.T.U./lb. on air-dried basis.

The entire State of Jammu and Kashmir in all its physiographic regions and Ladakh in particular suffer from an acute shortage of fuel. In Kashmir, fuel is known as "family fuel".

Jammu province has been depending on coal supply from Bihar because of facility of transport unlike the valley of Kashmir with its difficulty of transport in the past. In rural areas, sun-dried dung-cakes, twigs, willows, dry grass and wood collected from nearby forests are generally stored in winter for domestic use. In Srinagar, the capital, and in some of the flourishing towns like Sopore, Baramulla, Anantnag, Kulgam, the Government opens fuel supply stores where fuel is sold under rationing. For the city of Srinagar, 75,000 tons of firewood is estimated to be sufficient for its 600,000 inhabitants. One of the urgent problems before the Government is to save the timber used at present as fuel for it entails a great loss.

The standard of living is improving along will the rise in population. This will increase the demand for fuel which is estimated to be at about 150,000 tons per annum.

The only alternative to fuelwood is lignite since the use of electricity in its initial stage is costly for domestic consumption. The use of lignite briquettes designed by the Industrial Research Laboratory of Srinagar is being popularized in normal households. It should make up the present fuel shortage.

The use of gas for domestic purposes is believed to be convenient but for the present its use can spread only in cities and towns. The cost per ton lignite has been calculated at about Rs. 1000 including transport charges. Similar costs have been calculated per ton for briquettes. As industrial fuel for boilers and for other heating purposes, briquettes will be both useful and convenient.

The use of fuel gas proposed to be transmitted by pipeline under pressure to Srinagar from Raithan will be an ideal arrangement. But it will take time to complete the project and its success depends on many factors. The cost of 1,000 cft at destination has been worked out at about Rs. 3.00.

Recent mining operations have shown that field investigation is necessary to arrive at a correct estimate of reserves. Field survey represented on large-scale maps will be helpful in effecting economies. Experts from Germany and the USA have examined the areas of mining and ascertained the resources. They have also given technical advice for large-scale exploitation.

During the Second Five Year Plan, about 5 crores of rupees were spent on the development of lignite deposits. It evisaged a yield of about 1,000 tons a day. A power plant based on a raw lignite capacity of 10,000 kw, a briquetting plant to produce 300 tons a day and a gasification plant to produce 7.5 million cft. a day were commissioned. Due preparation by experts was made to implement this ambitious scheme of fixing up a fuel-gas plant of about 7.5 million cft. a day capacity including gasification. Oxygen generation, tar condensation, benzal recovery and tar acid recovery plants also started functioning. The manufacture of fertilizers, particularly when the agricultural yield was very low, was expected to be of great help to the farmer. An annual yield of 10,000 tons of fertilizers equivalent to 35 tons of ammonia par day with 4.4 million cft. of pure gas per day was the target fixed.

NATURAL GAS

The tertiary belt of Jammu is similar in age and lithological character to the portoliferous series of Rawalpindi. It is a part of the complex belt of petroleum bearing starta which runs from Persia to Burma. Though no live seepage has been located there are, however, bitumen, asphalt, gas seepage, salt licks, sulphurous water and afflorescent encrustrations as important indications. For natural gas Navsheta, Dharmthal and Ramnagar are the areas under investigation.

Existence of oil is also being investigated. 'Dry gas' has, however, been located near the Srinagar Silk Factory, where the ONGC is actively carrying out further investigation.

ECONOMICS OF MINERALS

Exploration, exploitation and utilization of some of the minerals has begun in the State of Jammu and Kashmir. A cement factory at Srinagar has been set up. Coal from Kalakote (Jammu) is used along with lignite mined in Nichihama (Kashmir). Intensive survey work is going on for developable reserves in coal, lignite, limestone, gypsum, bauxite and other minerals. Sampling method needs to be followed to avoid waste of investing capital.

During the Fifth Five Year Plan Rs. 4.25 crores will be spent for mineral development. The scope and target for the thermal power station at Kalakote is to set up its production to 70,000 tonnes per annum. Gypsum deposits, when ascertained will be utilized for sulphur, sulphrine acid, fertilizers, cement and gypsum boards. Limestone will be utilized for cement and soda ash, bauxite for industrial alum and high grade quartzite for crystal glass. Lignite and coal will form the fuel.

Chapter XI

SMALL-SCALE INDUSTRIES

ART OF WEAVING

The first covering used by man was the skin of animals. The discovery of twisting fibres into thread and of weaving thread into a fabric was a later development when man had learnt to apply leisure and intelligence to the growth of culture. The art of cloth-making is practised in all types of climates and the dwelling-place continues to be the centre of production from the Equatorial forests to the Tundra region.

In Kashmir, with its severe winter when climatic conditions are semi-arctic, handicrafts utilize leisure as well as creative intelligence. There are a number of these handicrafts: wood-carving, papier mache, wicker-willow work, kangri-making, Pashmina shawl embroidery, gubba, namda, carpet, silverware and imitation jewellery.

Princely patronage encouraged these handicrafts from early times till these products, light in weight but rich in art, found a market in India and across the northern boundary. With the opening of roads and airways, visitors to Kashmir were impressed with the scenic beauty of this land and also appreciated these handicrafts which found a ready market.

CARPETS

Carpets are said to have originated from the oases and villages of Central Asia. This art of Kashmir has been a gift of the caravans. In the time of Jehangir, the Mughal Emperor, this art was greatly developed by imported skill and imperial patronage.

The Europeans also took a keen interest in carpet-weaving and pooling of skilled labour, raw material and capital resulted in the establishment of some well-known factory units. The products made by these units were of exquisite quality and found a ready market in foreign countries.

The art of carpet-making is not as simple as it may seem. Proper education is imparted to the weavers in learning *Taleem*. This is the script to guide the worker in selecting the colours and the thread-patterns. In the year 1958, carpets worth Rs. 70,000 were exported. There are about fifteen factories with about 350 looms weaving carpets. The fineness of a carpet depends on the number of knots per square millimetre. The peculiarity of Kashmir carpets is that these represent the scenic beauty of the valley with its flora and fauna set in a diverse topography. There is no borrowing of texture or design from outside. In recent years, efforts have been made to pool the knowledge of weaving design and texture at the School of Designs and the Central Dye House. It has helped to organize production and cater to the aesthetic taste of the consumer. Cotton yarn is imported for carpets from Amritsar. The industry suffered as a result of the invasion by China in 1962 and its occupation of Aksai Chin, which led to the closure of the trade route to Tibet.

NAMDA

Wool is a by-product of the meat industry. It is not grown for its own sake like cotton. A third grade carpet wool, coarse and hard, is felted into *namdas*. This art came to Kashmir from the north, particularly Yarkand, hence the name *Yarkandi namda*. The dyeing of and embroidery on *namdas* have increased their utility and these are sold to the tune of about half a crore of rupees a year. More than 2,000 workers are engaged in this industry. In recent years, *namdas* have been exported to USSR and UK where the demand is on the increase. The processes of manufacture are carding, rolling, pressing, washing and embroidery. All this is done by hand. No mechanized process is available to avoid harm to the artisan's arm before the designs are improved.

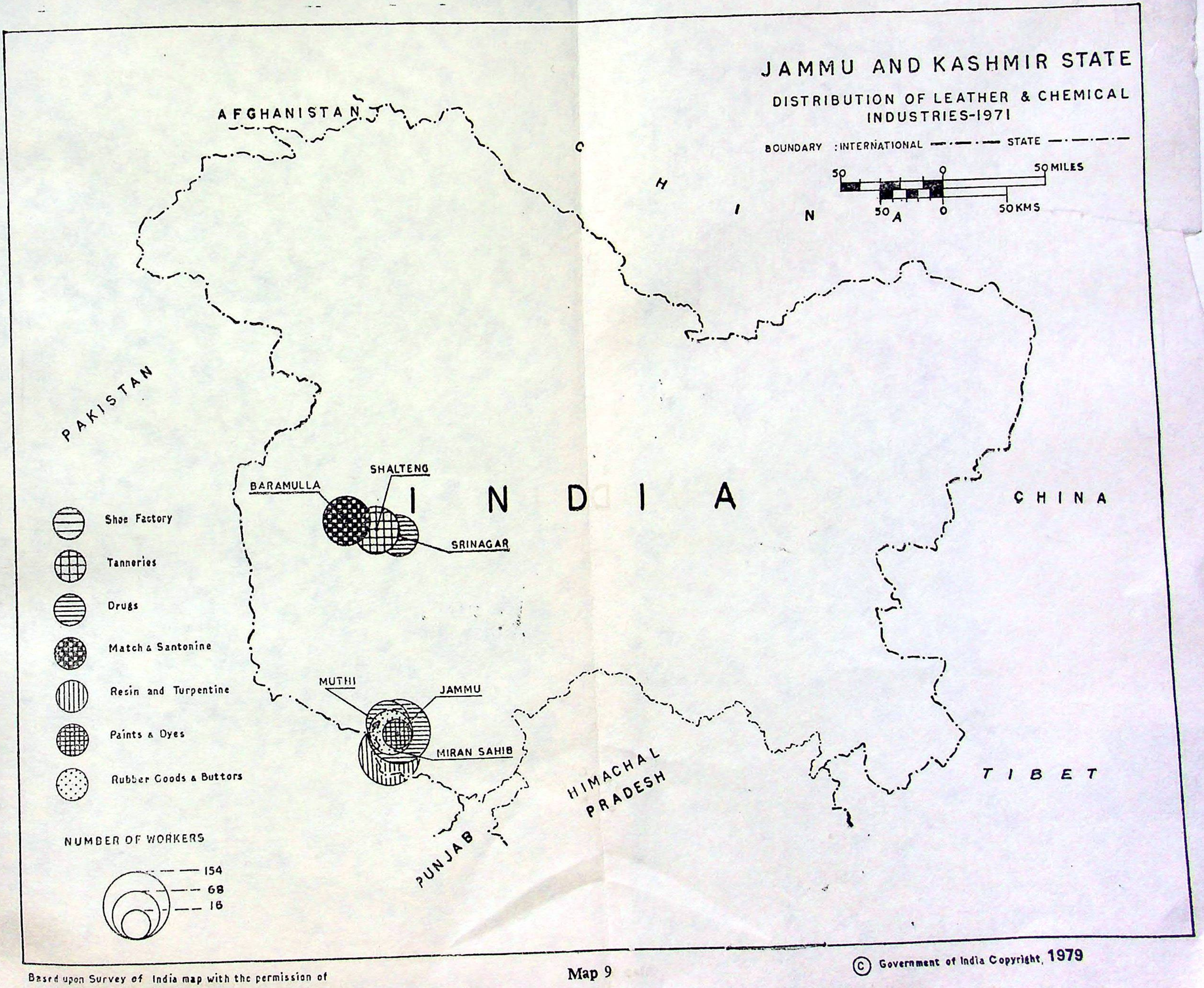
GUBBA

The coarse blanket as stated elsewhere, is still the main covering of a Kashmiri during the night. It is a must in winter when it serves the purpose of a quilt and during the day when wrapped it imparts a sense of ownership and economic decency to the person. After using it for many years its sheen wears off and when it tears, the blanket (*loi*) or *chadar* is made into a *Gubba*. It is a warm floor-covering as it looks attractive and being cheap is economical. From early times, Anantnag district has developed the art of dyeing, stitching and patching together these coarse woollen patches into symmetrical designs and patterns. To impart strength to these pieces of embroidery. Cotton and woollen threads in different colours is used to hide the stitching of the patchwork. A cheap cloth lining used is and to make the bed warm in winter raw cotton is evenly spread in between and stitched to make it into a warm mattress.

The patchwork, stitching, designs and use of different colours to make the *gubba*, a replica of natural landscape, has much to do with composite culture evolved in the countryside in a harmonious environment of varied scenic beauty of the valley of Kashmir.

Printing on plain cloth to make a *gubba* has started in Baramulla but not with much success. Attempts in many parts of the valley to make similar patchwork pieces as in Anantnag have not met with success. The size of a *gubba* varies from 3.6×3.6 m to the common size of 1×2 m.

More than 600 persons are regularly engaged in this industry besides over 2,000 workers who adopt it as a subsidiary occupation. Women and children assist in this work as deft-fingers are required for certain processes. *Gubbas* worth rupees five lakhs are manufatured in a year and the demand is still rising. The *Gubba* Manufactures' Cooperative Society is organizing production but cheap products find ready market and the goods are sold at rock-bottom prices. No shop or sale centre is required as the pieces can be taken even on the roadside at Qazigund where the tourists on their way to and from Srinagar provide a market for *gubbas*. The efforts to improve quality in material and design is apt to increase cost, resulting in a shrinkage of the demand. In these days when carpets are costly cheap *gubbas* are a substitute for floor covering. The interference by the government with a salaried staff may not be advantageous to the peasant-worker whose auxiliary occupation is to work only for some months in *gubba*-making. The effort to improve the *gubba* in material and designs is receiving greater attension now, but the future of this industry is not bright. It is to be seen if cotton yarn from Amritsar can be a substitute for wool to be carded into *namdas*.



JAMMU AND KASHMIR STATE

DISTRIBUTION OF LEATHER & CHEMICAL INDUSTRIES-1971

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Map 9

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KANGRI

Kangri is a sanskrit word meaning a fire-place first used by Upadeva. To a Kashmiri nothing is more indigenous and, therefore, typically Kashmiri than *Kangri*, the fire-pot. It is the result of experience spread over a very long time that made this object of creative genius possible. The *kangri* is a combination of baked-mud and wicker. *Manan* has been the ancestor of the *kangri*. The earthen pot around which *hatab* twigs are woven is called *kundal* in Kashmiri and the *kangri*-makers are known as *kanil*. They live mostly on the banks of the Wular Lake in the villages of Watlab and Botingo where women and children help in *kangri*-making.

In Tsrar village a special kind of *kangri* is manufactured, which is is known for its white wicker and glessy sheen.

The stout *kangri* is known as *grees-i-kangri*. It is almost double the size of an ordinary *kangri*. It is used under the *pheran*, the outer garment of a Kashmiri. The *kangri* gives warmth from the burning charcoal inside and the degree of warmth varies as shown below:

Kashmiri Word	*English Translation*	*Temperature*
Vushun Sur	Warm ash	10°C
Tot Sur	Hot ash	20°C
Sot Nar	Temperate hot	50°C
Josh Nar	Very hot	70°C
Tyongal Sur	Red hot	200°C

More than 500 families are engaged in *kangri*-making. They use *pohu, lim, kachu* and *hatab* in the form of twigs round the earthen pot.

The *Kangri* credits the Kashmiri as an object of perfection in indigenous art.

Mysticism has shadowed the genius of Kashmir in the past and the five ribs of *Kangri* represent the five elements that make the universe. The pot suffering patiently with fire is the goddess Shakti held fast by the masculine wickerframe-Shiva. It is believed that women have contributed to the perfection of this fine piece of art.

PASHMINA

Pashmina wool was imported from Tibet. It is the undercover of the sheep of that region. More than 5,000 pounds of this kind of wool was imported annually till the year 1956. These imports declined after the Chinese Invasion in the year 1962.

Pashmina industry is the oldest industry of Kashmir. Its origin is traced to the pre-Mahabharata times. The Mughals also encouraged the manufacture of shawls as a result of which these improved in quality and fineness of texture to such an extent that when pressed, a shawl could pass through a ring. Such a shawl is known as a "ring shawl". Bernier writes in the year 1665 when he came to Kashmir with Aurangzeb about the shawl-making industry in Kashmir: "The staple commodity which particularly promotes the trade of the country and fills it with wealth is the prodigious quantity of shawls which they manufacture and which gives occupation even to little children." Towards the close of the eighteenth century when Kashmir was under the Afghans, this industry thrived with a wide market extending even as far as Turkey. In the early years of the nineteenth century when the Sikhs conquered Kashmir, shawl-manufacture continued to be the main industry of Kashmir with a wide market.

The pashmina shawl is of two kinds: (*i*) the *kani shawl* and (*ii*) the *amli shawl*. The *amli shawl* is woven on the loom. The industry employs about 1,500 persons besides 5,000 women engaged in sorting, spinning and shaping. The *amli* shawl has its pashmina fabric embroidered with needles working to a pattern. This work is done in exquisite designs. No change has come into *pashmina* manufacture for a long time. Rice flour is still used for softening wool as of old and wooden combs prepared for cleaning in the district of Punch. Spinning is effected on a *charkha*.

More than 30,000 workers are engaged in shawl-making and the production per year is worth over a crore and a half rupees. Embroidery work is spreading fast in decorating mufflers, capes, baby coats, jackets, blouses and sarees.

Srinagar is the localized centre of this industry and the work of embroidery continues to be done in the workers' homes. The

Government Arts Emporium is also engaged in improving the quality of shawls which are exported to foreign countries. The role of middlemen is still there, as there is no direct contact between the buyer and the artisan. The main exports are to the UK and the USA. The population of artisans is given below:

Place	*Population of Artisans*
1. Srinagar	15,000
2. Tangamarg	1,200
3. Ganderbal	10,000
4. Harwan	2,000
5. Nishat	15,000
6. Shalimar	1,000

In recent years much has been done to improve the processes of washing, combing. carding and embroidery. This industry provides subsidiary employment to more than 30,000 persons in villages including womenfolk and children.

IMITATION JEWELLERY

The manufacture of imitation jewellery is concentrated at Srinagar where more than 40 cottage units are functioning. About 23 units manufacture turquoise ware which consists of bales and dyed *pashm* stone. The work of imitation jewellery consists of two processes: (*i*) the cutting and dressing of stones by *hakaks* and (*ii*) the setting of stones in brass and silver by *zargars*.

The industry employs about 4,000 artisans. Very little capital investment is required for this industry. A few hand tools and a couple of grinding wheels manufactured locally with five persons working in a small room can form a productive unit. These cottage products consist of bracelets, brooches, tops, bangles, rings, cuff-links, cigarette-cases, powder-boxes, ash-trays, and flower vases. These are mostly exported to the USA and the USSR. The raw material consists of jade, *cayz*, *Pashm*, tiger gold, *pheros*, *bakarmohar*, cat's-eye and various types of glass chatons and glass beads. The School of Designs set up by the Government has recently taken up the work of improving this industry both in quality and in quantity.

SILVERWARE

As a metal with remarkable malleability, durability and beauty, silver has been used by the artisans in Kashmir from early times. The use of silverware and its engraving began when the Mughals encouraged crafts in Kashmir. Coins of copper were mostly in use in the time of Afghan rulers but in the reign of Akbar, Srinagar became a mint-town of some importance where gold and silver was coined. This has been stated by Abul Fazal. Indigenous talent depicted in these enrgavings the beauties of nature.

Being cheaper than gold silver was also shaped into ornaments of everyday use to suit tho purse of the people. The facilities for travel encouraged tourist traffic, thus influencing tastes, arts and crafts. The artisans imparted freshness to their making of silverware which became an industry of importance. Winter, an otherwise unproductive season, afforded an opportunity to skilled workers to concentrate on engraving articles of silver like dinner sets, tumblers, boxes and trays, cigarette cases, toilet and soap cases, toys, etc. The process of engraving, cleaning and gilding are all done under the supervision of the finaciers who arrange raw-material, wages to the labour and instructions to the industry.

There are about 200 artisans engaged in this industry at present producing silverware worth about Rs. 4 lakhs annually. Silver is purchased in bars from Amritsar and Delhi. With a typically special type of engraving the chinar pattern, Persian pattern and lotus pattern are sent to Amritsar, Delhi, Calcutta, Madras, Bombay and other cities. Use of machinery for precision and delicateness, save labour for changing silver bars into sheets of various thicknesses, polishing and cleaning improving designs and training of artisans and fixing of of a reasonable wage are ancillary problems of this industry.

Foreign tourists have a sort of fascination for the workmanship of Kashmir and its gift of traditional skill. More than 50,000 tolas of silver are imported annually to meet the demand for Kashmiri silverwares.

WICKER-WILLOW

The industry of wicker-willow making is a gift of the French to Kashmir. Wall-baskets, flower baskets, lampshades, curtain rings, sofa sets, chairs, tiffin-carriers and boxes are made of wicker-willow in beautiful designs. Some French experts introduced bush-type of wicker-willow plantation into Kashmir. More than 2,000 workers are engaged in this industry producing goods worth over Rs. 400,000. The local demand is hardly one-fourth of the total production. Srinagar, Haren, Shalabug, Hazratbal and Sowra are the important centres of production. The industry is still in the cottage stage and the dealers advance money to the artisans who prepare goods in winter before the tourists season begins in April. The raw material is wicker-willow which is a monopoly of the State Forest Department. Bush-type wicker-willow is grown by the villagers. Its cultivation is helpful to the agriculturists who sell a maund of wicker-willow for about Rs.35.

Improvement in designs, proper training in this craft and reducing the price of wicker-willow will encourage this industry for which the demand is increasing steadily.

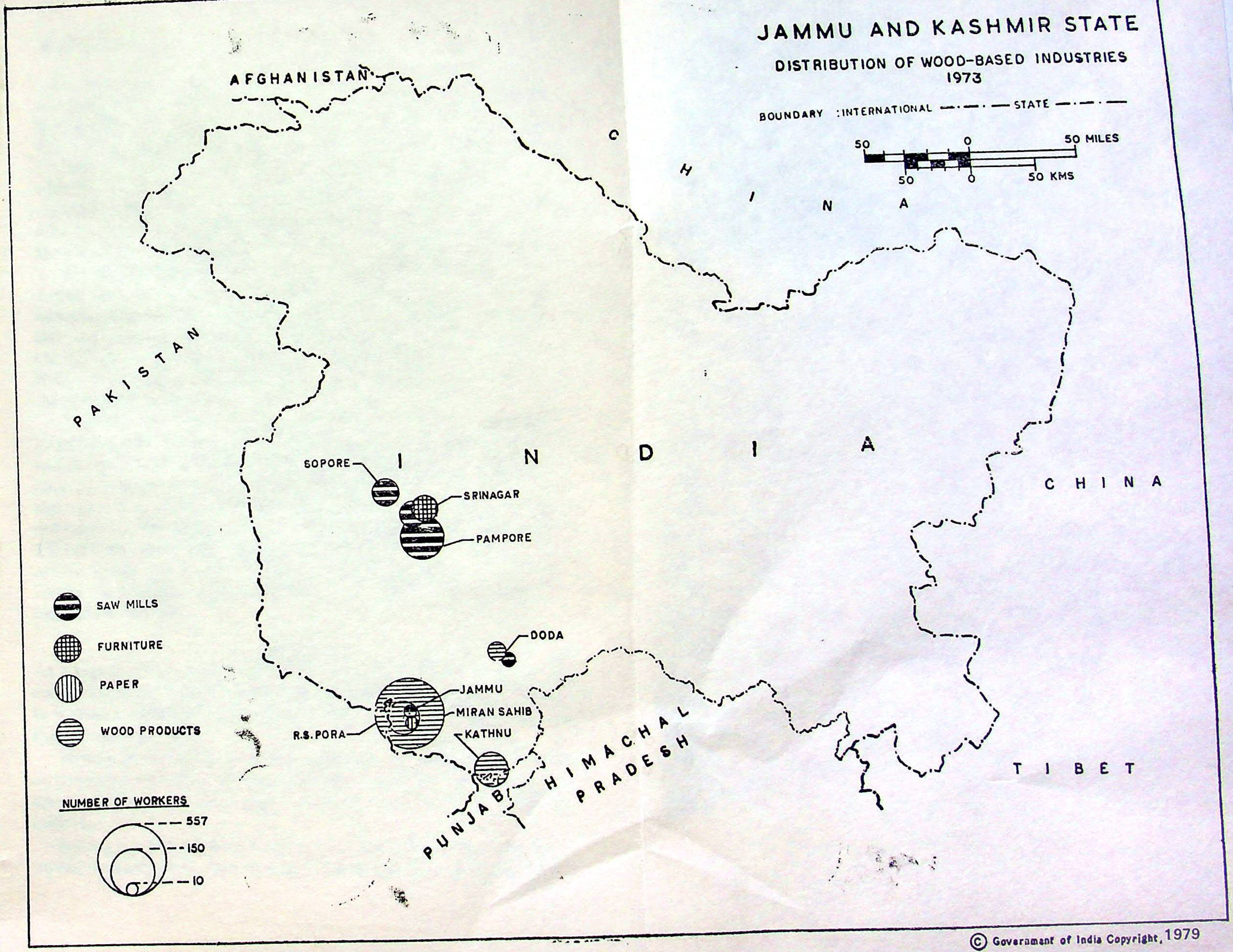
PAPIER-MACHE

Originally Iranian, the industry of papier-maché is a monopoly of Kashmir. The rich and exquisite floral designs painted on paper include chinar leaf, iris, rose, almonds, painted hyacinth, tulip and cherry blossoms. The painted birds are the kingfisher and the bulbul. The articles on which these designs appear are vases, powder-boxes, table lamps, book-ends, paper-knives, toilet sets, jewellery-boxes, wall-plaques and other articles of decoration.

Recently wood has been used for painting these designs but the preference is for wood-pulp which is essentially the raw material for papier maché. Pulp-making is a tiring process in which paper, cloth, rice-starch and copper sulphate is ground together by *Sakhata*-makers. They give shape to this material in wooden moulds. More than 40,000 workers are engaged in this work producing goods worth Rs. 400,000 a year. There is demand for *papier-maché* goods in foreign markets, particularly in U.K. and U.S.A. Recently Nirmal Artwares manufactured in Hyderabad (Andhra Pradesh) have entered into competition in this trade. The demand for artisans dealing in papier-maché may constitute a means to withstand the competition which this cottage industry has to face now.

WOOD CARVING

Forests are a rich resource of this land. Rich and varied forest wealth has been properly utilized by the skilled workers of Kashmir. Wood carv-



JAMMU AND KASHMIR STATE

DISTRIBUTION OF WOOD-BASED INDUSTRIES 1973

Map 10

Based upon Survey of India map with the permission of the Surveyor General of India.

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ing was originally patronized by princes and aristocrats. This industry mostly depends on tourists. More than 1,500 workers are engaged in this industry. There are about 300 units concentrated at Srinagar in Fateh Kadal, Kade Kadal, Zana Kadal and Rainawari.

Here again dealers are in touch with consumers. Orders are placed with them and they order cottage workers to prepare goods. It is essentially the job of carpenters who work in the slack season to earn a living. Seasoned wood is mostly in demand and carved goods find their way into the market.

The Government set up a walnut-wood seasoning plant with a capital investment of Rs. 50,000. The main designs are (1) Kashmir flowers, (2) fruits of trees, (3) shawl, (4) lotus, (5) *Rezkar* (geometrical) and (6) European design. In recent years, articles of wood-carving have found a market in Baghbad, Singapore, Aden and London. If the articles exported are fine in workmanship, it is possible that the demand may increase.

The value of wood-carved articles may be estimated at about Rs. 30 lakhs a year. Export trade of wood-carved articles is at an increase and its market has extended to Baghdad, Singapore and Aden. Book racks, jewellery boxes, book ends, small side tables, decorative pieces and walking sticks are some of the goods exported. There is no standard prices as these articles are mostly luxury goods with artistic make. Till recently master craftsmen used to work in winter and prepare artistic goods per orders—mostly in floral design. These craftsmen known as *Ustakars* receive payment in advance and utilize winter months for this work.

GUN-MAKING

As a matter of fact country weapons were manufactured from very early time in the State of Jammu and Kashmir. References are found in Kalhan's *Rajtarangini* about the making of such weapons even before the eighth century.

Having been patronized by the Dogra rulers, gun-making is an old occupation in the State of Jammu and Kashmir. At present there are more than hundred gun-making units all over the State except in Ladakh.

During the Second Five Year Plan skilled labour with subsidized capital started more than 80 units. There was already a special class of blacksmiths known gunsmiths or *Banduk Khars*, who lived at Srinagar in the vicinity of Hariparbat fort. These blacksmiths performed all operations of gun-making by hand to make single barrel muzzle load, double barrel 12 bore and single barrel 12 bore. There are three types of guns prepared locally. The indigenous muzzle load gun has been the success of gun-makers in this land. This gun is used for shooting both the small and big game in the lakes and forests. A special type of a gun 1dm diameter barrel with the same mechanism, though heavy, is fixed to a boat with its muzzle pointing over the keel. The boat when oriented automatically gives the alignment to the gun with its target—a flock of ducks or geese and other water birds. Under a restricted control of the government and being a subsidized enterprise, there is no scope for expanding employment. At present the testing of guns is done at Ishapur (West Bengal)· which involves an additional cost to the purchaser.

There are about 40 gun manufactering units in Jammu and Kathua. Besides meeting the local demand, guns are supplied to the Government of India. Gun manufacture appears to have a bright future.

NARA

In and around the city of Jammu. *Nara*-making is a part-time industry in the villages of Bishnah. Sumelpur, Kot Palwal and Sarbah. The *nara* is a two metre long webbed lace used for tying *Shalwars* (trousers), and other ladies garments. In fact, some persons purchase yarn and distribute it in villages for *nara*-making and when ready these are sold in the market. The Jammu *nara* is still prized for its softness and colour as against the Amritsar and Dinanagar products which are coarse. *Nara*-making fetches approximately Rs. 200,000 annually. A small industry with a local market for *nara*-making map not possibly expand like its counterpart, the braided cords of Amritsar.

CALICO PRINTING

Samba is at a distance of 40 km to the south of Jammu. Samba is known for its prints. The indigenous colours are *Majih* (Indian red), *Navtati* (red), *Haldi* (yellow), and indigo (blue). After the year 1947 this industry organized itself with sets of wooden blocks from Farrukhabad (U.P.) purchased for rupees six hundred each. The colours used in Samba prints have been in use from early times. Since very little investment is required many units have been set up. Cotton and silk cloth began to be printed with good quality dyes imported from other parts of the country. The future of this industry is not bright in view of the superior printing processes made possible by use of dyes, different designs, skilled labour and cheap printed cloth now prepared elsewhere.

LEATHER FOOTWEAR

The village cobbler continues to be a factor in the rural economy of the State. He satisfies the need of the agriculturists both in respect of shoes and other requirements of leather goods. Generally these leather shoes of indigenous make were put on show and sale in village fairs (*melas*). With urbanization, the demand of villagers for male and female footwear increased with the result that in the city of Jammu, the production centre at Siranjan-di-Dakki increased to about 30,000 pairs of chappals and 50,000 pairs of shoes a year. This figure has been arrived at by a survey at the production centres.

Recently with the opening of roads in the Outer Plain and Outer Hills of Jammu, better footwear from India has spread to the interior but the dwellers in the mountain terrain still prefer the local product for its durability. In artistic design, durability may now be sacrificed for show but old shoes are purchased by artisans in Jammu who sell these after repair in thousands to the villagers.

CHARCOAL-MAKING

Charcoal-making is concentrated in Hiranagar and Kathua along the Pathankot-Jammu Road. *Kikkar*, *shishra*, *shisham* and *pilan* which are hard woods are burnt in kilns for making charcoal. The kilns work for 3 to 4 months, producing about 50,000 maunds of charcoal worth over rupees 200,000. The demand is on the increase since the use of charcoal is preferred to that of firewood. The Government has not taken up this industry with seriousness even though charcoal from Jammu, if stored in Kashmir, would ease the vexed problem of fuel shortage there.

COUNTRY WINES

Attempts to establish distilleries for the manufacture of wines from a variety of fruits in Kashmir and Jammu have been made in the past.

A recent venture was made by the Kashmir Fruit and Chemical Industries Ltd. near Hazuri Bagh at Jammu. Several varieties of wines like the Kashmir XXX rum, No. I Brandy, Orange Gin and Dry Gin are prepared with careful and scientific processes. The latest success has been a reputation of its flavour as a result of these wines with a blend of scotch whisky. The industry has a future in view of the limited supply of foreign wines and liquors. The demand is on the increase and the industry has attained the status of a large-scale enterprise. The popular brands of wine in demand are the Marshall, the Tourist and the Malted. These are prized for their Scotch-blend tinge,

More than seventy gallons of country liquor a day are believed to be smuggled into the city of Jammu from the Bhor Camp, Simbal Camp and some areas near Ranbirsinghpura. The rush of traffic has abetted this and spare rubber tubes, petrol cans and utensils used by milkmen are reportedly utilized. The bottle-belt is a new device round the waist wrapped by *lachas*—a single-piece dhopti used by males.

The *bhattis* are spread in villages where big iron-drums are filled with gur at the rate of 120 grams per bottle. The bark of *kikkar* tree is mixed with *Navsadhan* (ammonium chloride). Churning is done for a week till the experts smell the obnoxious liquid and determine its optimum fermentation. It is then that fuel is burnt below the drum and through the single hole in the upper lid vapour escapes only to cool and drop itself into an earthen vessel kept under the effect of cooling water. It is a process of filtration, evaporation and condensation, all in one. The consumption of country liquor is on the increase in the city and a study of the Jammu region establishes beyond doubt that this industry is well spread throughout the province.

Chapter XII

THE INDUSTRIAL LANDSCAPE

There has been a considerable growth in the small scale industries. So far as large and medium industries are concerned the Fourth Five Year Plan registered progress because of facilities in infrastructure and availability of power. Rural electrification enabled improved methods in the milling of foodgrains. The use of mechanised transport increased mobility of men and material. Village and cottage industries widespread in the State, came out of their traditional framework aspiring to use a modern technology and trained skill. Machine-based industries on a small scale showed good results as some of the agro-based industries of small size, metal works, textile units and wood-based units started functioning.

The industrial sectors continue to be underdeveloped. The small contribution is from the handicraft industries. Besides embroidery Kashmir is known *gubba*, *namda*, woodwork, wicker-willow and shawls.

The large-scale industries worth mentioning in the State of Jammu and Kashmir are five textile mills and a cement plant. The two silk, two woollen and one cotton mill constitute the textile sector. This is not an encouraging picture as the State has a low income yielding household industry—60 percent household, 40 percent non-household. Large-scale industries constitute 11.8 per cent, medium-sized 2.9 per cent and small-sized only 26 per cent.

In recent years financial assistance has been advanced on concessional terms. The Jammu and Kashmir State Industrial Development Corporation has laid a criteria for assistance and technical consultancy. The industries shown in table on next page have been taken up.

The Central Government has taken up some major public sector units like ancillary unit of Indian Telephones Industries, a watch manufacturing unit of the Hindustan Machine Tools at Zandakot (Srinagar) with an annual capacity of 33 lakh watches. Manufacture

Products	Industry	Location
1. Electric Lamps Irco brand—3 lakhs a year	The India Radio Co.	Srinagar
2. Cigarettes worth ten crores in 1976	The Golden Tobacco Co. of Bombay (Semi-Government)	Jammu (Bari Brahmnan)
3. Cables		1. Jammu 2. Kathua 3. Hiranagar
4. Cotton Cloth	The Chenab Textiles (Semi-Government)	Kathua
5. Watches	Government H.M.T.	Srinagar
6. Bricks Tiles	Government Concern	Pampore Srinagar
7. Iron-sheet	Iron and sheet rolling mills	Jammu
8. Agricultural Implements	Suri Steel Works	Jammu
9. Iron and steel furniture	1. Kamal Industries 2. R.K. Lakra Industries 3. Nanda Steel Works	Jammu
10. Rice, flour, cold storage mills	Rice, Flour Mills	Jammu Ranbirsinghpura Kathua Hiranagar Srinagar Avantipur Baramulla Anantnag

of television sets and precision tools and a cigarette factory to produce 4,500 million cigarettes per annum is receiving attention.

There are thirteen industrial estates functioning in the State. Seventy-six units which are housed in the estates provide employment to 1,039 persons. The production of these units has been to the tune of Rs. 83.79 lakhs in 1965-66.

A number of factories in the public sector have recorded appreciable development in the recent years. These include the Government Woollen Mills, Srinagar; the Government Joinery Mill; the Silk Weaving Factory, Rajbagh; Handloom Silk Weaving Factory, Srinagar; Government Arts Emporium, Kashmir Willows, Miran Sahib, Jammu; Rosin and Turpentine Factory, Miran Sahib, Jammu to mention a few.

SILK

In the State of Jammu and Kashmir sericulture is based on the mulberry tree. The Government declared this valuable tree as 'reserved'.

A moth known as the silkworm makes a fine cocoon. The fibre of the cocoon is utilized to make the silk thread. Just as a spider makes its web so does a silkworm but the difference is that the silkworm winds its thread around itself, as a result of which it can be easily unwound if the worm is killed: This is done by roasting before it cuts the thread to emerge from the cocoon. Once the worm is killed several cocoons are put together and fine silk fibre is unwound and about five such fibres put together make a silk thread. It is laborious work needing dexterity and care. The silkworm is fed on the leaf of the mulberry tree grown in a tropical-cum-temperate climate with a modified mediterranean spring (March-June).

History

The mulberry culture originated in China. It was a household industry of the royal family guarded with care and jealousy. The mulberry culture spread within 33° to 35° North Latitude. It is believed that more than 3,000 years before Christ, silkworm rearing began in Shantung (China). The Empress I-Sing-Chi who is supposed to have invented the weaving of silk somewhere before 2,700 B.C. is still worshipped as the silkworm goddess in China. The industry extended beyond Shantung to Korea and Japan. Inspite of all precautions mulberry culture spread to the west. Some christian missionaries visited Khotan where they learnt the art of silkworm rearing. Then they collected the mulberry seed in the hollows of their bamboo staves. Thus these apostles of the Christian faith came to Asia Minor and Syria wherefrom sericulture spread. In the beginning of the fifteenth century, France began an extensive programme of silkworm rearing when Louis XI took keen interest in cocoon rearing. Henry IV of France was the first to wear silk stockings when a mill for winding, twisting and reeling of silk was set up at Lyons.

It is not easy to say when silkworm rearing began in India but this art was known in Central Asia before A.D. 400.

In Kashmir trade and travel was brisk from Persia, Kabul and Egypt. Having shared the secret this precious little industry established itself and its yield entered the exports to the Persian Gulf. The Tartars gave silk the name of *ser*.

Silkworm Rearing in Kashmir

Kashmir is the best known centre for silk production not for its bulk production but for its best quality silk compared to that of Bengal and Mysore. What it suffers in quantity it gains in quality. About 2.5 lakh pounds of raw silk a year of monovoltine breeds of silkworms are produced. During the Second World War silk was used for the manufacture of ammunition. The demand increased and Kashmir supplied over a lakh of pounds of raw silk fit for the manufacture of parachute cloth. Thus came the silk boom.

The State protects the mulberry tree and its leaf by law since 1925. Fresh mulberry plantation in nurseries and transplantation and free distribution of plants to farmers has been a common practice. Assistance and guidance for silk-worm rearing in villages and the sale of cocoons to the Government at fixed rates has been strictly implemented. Frequent purchase of silkworm eggs from foreign countries and its supply to the rearero in villages saved this cottage industry.

However, disposal of sericultural products to the market is economically important.

Complete monopoly of the State is to control and organize silk from its agro-stage to the finished product. The silkboom did not last long. Stagnation came in and the industry deteriorated. The problem of leaf, labour and accommodation came up. Leaf is the crux of the problem. An average life of a mulberry tree is about seventeen years. The leaf yield per acre is about 7,479 lbs. The dwarf leaf has a maximum age of six years. Korea and Japan supply seed to the State of Jammu and Kashmir. In the year 1972, 10,000 ounces of seed (Korea 8,000 and Japan 2,000) was purchased at a cost of Rs. 523,520. At present nineteen schemes are under active operation and the Planning Commission has allotted Rs. 28.62 lakh rupees. The total cost is calculated at Rs. 42.62 lakh. Recent survey of mulberry raw silk in factories reveals the following data:

	Filatures	*Dupion*	*Total*
Kashmir	33276	400	33676
Jammu	12000	—	12000

Economics of the Silk Industry

The silk industry is essentially agro-based. The mulberry leaf is the protein food for the silkworm to store material for the production of silk fibre to form the cocoon. The industry having deteriorated requires to be nurtured to grow in size and stature. The Indian Tariff Board thoroughly examined the prevailing conditions in 1933, when reforms were suggested.

Social amenities were provided for labour as under :

Provision of a maternity bonus per birth, sickness allowance, contributory provident fund, social welfare centres, adult education, medical facilities, accident fund, accommodation to vendors near the spot and training to the workers and other facilities provided in 1942.

The deterioration of the silk industry in the State after 1947 was noted and desired to be rectified in the First Five Year Plan.

Development in Plan Period

It is believed that profitability of this industry suffered for want of free enterprise by the farmer. Therefore, a careful study became necessary in the policy of monopoly control from leaf to yarn. The rising demand for superior silk in the Indian market with rise in price from Rs. 38.50 to Rs. 45.51 per lb encouraged production. A study of the price policy and the system of allotting raw silk quotas to private sector was necessary.

Intensive fieldwork in silkworm rearing is in progress despite all the handicaps. The following is the latest position (on next page).

In recent years 25.000 ozs. of Japanese silkworm seed have been imported. The yield per ounce has been calculated at 82 lbs of cocoons. It is double than the yied from the local seed. The distribution of seed to local rearers is followed by regular supervision of growth from moult to moult with feeding of mulberry leaf from time

Quantity Of Seed Distributed For Rearing, April 1974

Province	*Tahsil*	*Seed in oz.*	*Yield of cocoon in kg.*
Kashmir	Badgam	350	12,905
	Beru	386	12,469
	Ganderbal	900	30,630
	Tral	1,500	44,785
Jammu	Akhnoor	200	6,800
	Jammu khas	215	7,215
	Samba	110	3,200

to time. The rearing centres in villages are given facilities by the sericulture department. The following is the distribution :

Distribution in April 1974

Tahsil	*Village*	*Ounces of seed per household.*	*No. of Households*	*Yield of cocoons in kgs.*	*Average yield per ozs.*
Srinagar	1. Pampore	47½	6	3,166	65.65
	2. New Theed	6	1	216.3	36.5
	3. Jawbrari	40½	7	2133.7	52.68

Cocoon Production (in maunds)

Years	*Kashmir*	*Jammu*	*Total*
1966-67	20,156	5,952	26,108
1967-68	16,481	5,870	22,351
1968-69	17,430	5,539	22,969
1969-70	11,250	6,213	17,463
1970-71	14,100	6,238	20,338
1971-72	16,400	7,382	23,732
1972-73	14,200	8,128	22,328

Rawsilk Production

Year	*Kashmir*	*Jammu*	*Total*
1966-67	58,869	15,503	74,372
1967-68	48,219	13,412	61,631
1968-69	36,869	12,514	49,373
1969-70	30,478	12,375	42,853
1970-71	36,921	12,102	49,023
1971-72	38,346	13,288	51,634
1972-73	44,977	18,024	63,001

Number of Rearers

1966-67	28,216	7,500	35,716
1967-68	27,790	7,400	35,190
1968-69	25,563	7,400	32,963
1969-70	23,126	7,400	30,526
1970-71	24,749	7,644	32,393
1971-72	25,606	8,034	33,640
1972-73	25,900	9,400	35,300

Manufacture

The silk industry retains its traditional character and provides employment to 3,415 persons and subsidiary occupation to 33,000 families. The seed production is about 28,000 ounces a year now. The production of cocoons is expected to be 26,667 maunds and 79,000 kgs of raw silk.

In durability Kashmir silk is at the top in India. For its lustre, people prefer it even to the Japanese and French silks. The silk-weaving is concentrated in Srinagar at Solina, Hawal, Rainawari, Mughal Masjid thus forming a ring round the urban fringe of Srinagar.

Present Position

It is difficult to determine the scope of silkweaving in the State for various reasons. With rising prices, diminishing production was lost sight of, otherwise according to some authorities, the yield has gone down considerably. Taby is sold in unfinished form as there are no facilities for washing and dyeing fabrics properly. Efforts to pool processes will be of help in effecting economics, as cost on transport is also added at present. Silk weaving will indeed, need more raw material, technical skill and organization with research findings if it is to develop according to the varying tastes of customers.

The Syndicate System introduced recently has also shown good results particularly where the artisans are too poor to finance their enterprise. The Kashmir Silk Syndicate, for example, assists weavers by purchasing their market-products at reasonable prices. This applies to all cottage industry products in the State of Jammu and Kashmir. The Department of Industries could survey such industries and examine the validity of granting loans to encourage and develop various industries.

The Government Woollen Mills, Srinagar is another large-scale factory. The mill is being renovated and modernized.

The spindles installed at present in the factory are : (1) woollen spindles, 2018 ; (2) worsted spindles, 1576. The workers engaged in in the factory number over five hundred on piece-wage and daily wages.

Production of yarn at the spinning stages during 1966-67 was :

(1) Woollen yarns	108,817 kgs
(2) Worsted yarns	26,343 kgs

Production of fabrics (greasy) for the year 1966-67 was :

(1) Woollen	102,591 metres
(2) Worsted	25,115 metres

The Government Arts Emporium has its branches at Srinagar, Jammu; Amritsar; Connaught Place, New Delhi; 5 Prithvi Raj Road, New Delhi; Lucknow; Calcutta; Madras; Bangalore and Bombay. The organization has two types of production centres attached to it, namely, own production centres and organized production centres. The production centres are : (1) Embroidery Centre at Namachabal ; (2) Carpet Centre at Namachabal ; (3) Raffal Shawl Centre at Nowshera and (4) Samba Print Centre at Jammu.

There are eight organizer-managed centres of the Art Emporium; one pashmina centre, one *raffal* weaving centre, one *gubba* centre, three carpet centres, one wood carving centre, one papier-maché centre and one *namda* centre.

Annual production from own centres and purchases from organizer centres are worth about Rs. 25 lakhs.

The sales of the Srinagar branch of the organization are between Rs. 8 to Rs. 9 lakhs annually.

The Joinery Mill at Pampore is a wood-based factory with the following production capacity ; (1) doors 20,000 per annum, (2) windows 60,000 per annum, (3) tongues and groove-boards 80,000 rfts. per annum, (4) other furniture worth Rs. 30,000 approximately. It has achieved the fixed target of Rs. 2200,000 per annum.

The forest-based Rosin and Turpentine Factory at Miransahib, Jammu was set up by the Government in pursuance of the policy of industrialization and utilization of indigenous raw material available in abundance within the State. The factory distils about 69 to 70 thousand maunds of rosin annually which are collected by the villagers residing in the vicinity. The total sale proceeds of the factory were Rs. 23,96,642.74 during the year 1965-66 and these increased to Rs. 24,67,855.65 in 1966-67.

Another wood-based factory, namely, Kashmir Willows, Miransahib has a manufacturing capacity of 50 to 60 thousand cricket bats annually. It is one of the largest manufacturing concerns of cricket bats in the country at present.

NEW PROJECTS

A number of new projects are expected to be started in the near future. The projects include a unit for production of watches, and telephone components, and TV Studio. The watch factory will be set up by the Hindustan Machine Tools Ltd. and a team of experts is busy to start the project. The Telephone Components Factory will be established by the Indian Telephone Industries and it will also manufacture transistor sets.

The TV project which is being implemented on a priority basis is estimated to involve a cost of Rs. 1.50 crores. The TV studio thus set up will have highest mast in the country and will have a broad range. It has started functioning.

The implementation of these projects, it is expected will open new employment opportunities for the people of the State.

The total working population in the State is 1,373,901 out of which 1,290,570 are males and 83,331 females (1971). The rural population is 1,146,681 with 1,073,138 males and 73,543 females. A thin proportion of urban working population is 227,220 out of which 217,432 are males and 9,788 females.

INDUSTRIAL DEVELOPMENT CORPORATION

The State Government subscribed a sum of rupees one hundred and fifty crores in the year 1969 when the Industrial Development Corporation was incorporated under the Indian Companies Act. Economically viable and technically feasible projects were taken up for the speedy development of industrialization in the State. Financial assistance, technical service and procurement of raw material were arranged for setting up of various industries in the State. Some of the projects have already been taken up.

Sugar Factory and Ancillary Units

With the cultivation of beetroots on an area of 8,000 acres of land it was envisaged to get sugar for the State. In affluent European countries with similar agro-climatic conditions beet is grown and in Kashmir valley the proposed annual yield is about 20,000 tonnes to meet the requirements of more than 2,500,000 people.

Being a rotational crop beet will be followed by Chinese cabbage and soyabean. On an area of 24,000 acres 30,011 tonnes of Soyabean will be grown and considerably make up for the shortage of vegetable oil in the State.

The spruce and fir trees in the forests of Kashmir will be utilized for a sack kraft and corrugated board project with a capacity of 150 tonnes a day. The project when complete will yield a gross profit of Rs. 6.25 crores.

A glass bottle plant will be set up to meet the annual demand of 10,000 tonnes a year on the basis of figures for 1973-74.

The other proposed projects during the Fifth Five Year Plan are :

(*a*) Maize Processing	Cultivation in 604,225 acres to be of improved quality and yield.
(*b*) Walnut Processing	Drying of walnuts in Kashmir Valley.

(*c*) Chemical Industrial Complex	Bauxite deposits to increase the quantity of mixed fertilizers.
(*d*) Poly Urethene flexible and rigid foam	Manufacture of Poly Urethene foam with an annual capacity of 250 tonnes.
(*e*) Hard and Particle Board from Paddy Husk	Paddy husk from rice mills to be utilized for hard particle board.

Progress in small industries has been fairly good than in the sphere of large-scale industry. About 2,000 small industrial units have been registered employing about 10,000 persons. Powerlooms number 692 and handlooms 2,100. These employ 5000 persons. More than 88,000 persons are employed and production has reached 16 crores of rupees per annum. There is an international market for these goods. The sales rose to Rs. 99 lakhs in 1973-74 and goods worth Rs. 7.27 lakhs have been exported to the foreign market.

About 900 lakhs of rupees have been allotted for the development of small scale industries during the Fifth Five Year Plan and it is expected that the Directorate of Handicrafts and other similar organizations will train personnel and artisans so that both internal and external trade in these goods is boosted up.

Prospects and Problems

During the Plan Period the outlook for industrialization appeared bright. The State Government is planning to raise the level of industrial potency dependent on available raw material. Tobacco (cigarettes), textiles, fruit juice, vegetable dehydration, spinning, leather, rice mills, woolen mills and handloom silk received attention.

Chapter XIII

POPULATION DISTRIBUTION ANALYSIS

REGIONAL DISTRIBUTION

The census for the year 1971 held in the State of Jammu and Kashmir was the eighth in the series of regular decennial census. The splitting of the State by the Ceasefire Line in 1949 left 79,778.1 sq. kms. of territory on the Pakistan side. The area on the Indian side remained as 1,388,992.1 sq. km. The Ceasefire Line was neither a boundary nor a geographical frontier but a line demarcating the areas on either side. The administrative areas had to be reorganized because of the loss of territory. Only three districts remained unaffected in the Jammu province and these are Jammu, Kathua and Udhampur. In the valley of Kashmir the district of Anantnag remained unaffected. New *tahsils* had to be carved out for administrative convenience. The two *Jagirs* of Punch and Chenani formed part of no district but these were merged with the district of Rajauri and Udhampur respectively.

The People's Republic of China was proclaimed in 1949. Its forces had infiltrated into Tibet prior to 1962, in which year, however, they openly occupied that country. Thereupon India recognized Tibet as a region of China and thereby gave up its extra-territorial rights and privileges existing till then.

The Chinese forces launched a massive attack in October 1962 and claimed about 41.500 sq. km of this area of Indian territory in Ladakh and the North East Frontier Agency. In November a unilateral ceasefire was proclaimed by China after having sliced off the whole of Aksai Chin in Ladakh. The original longitudinal extent of 80° 20′ East shifted, therefore, to near 78° East towards Cheshul and Demchok in the south.

The Ceasefire Line was altered at certain places when the Line of Actual Control was adopted between India and Pakistan on December 11, 1972. The readjustment of areas for administration was necessary. As a result a new district Rajauri and twelve new *tahsils* were carved out. The administrative divisions and subdivisions are shown below:

Province	*Districts*	*Number of Tehsils*
Jammu	Udhampur	4
	Jammu	4
	Kathua	4
	Rajauri	3
	Punch	2
Kashmir	Anantnag	6
	Srinagar	5
	Baramulla	9
	Ladakh	3

The total population of the State of Jammu and Kashmir on the Indian side of the Ceasefire Line in 1971 is 4,616,632 (males 2,458,315 and females 2,158,317).

The distribution and density of population district-wise in 1971 is given below:

District	*Total Population*	*Males*	*Females*	*Population per sq. km*
1. Anantnag	832,280	450,353	381,927	155
2. Srinagar	827,697	447,508	380,189	275
3. Baramulla	775,724	419,862	355,862	104
4. Ladakh	105,291	53,315	51,976	N.A.
5. Doda	342,220	181,424	160,796	29
6. Udhampur	338,846	177,596	161,250	74
7. Jammu	731,743	381,138	350,605	231
8. Kathua	274,671	142,989	131,682	104
9. Rajauri	217,373	114,380	120,993	81
10. Punch	170,787	89,700	81,037	103

There has been inter-district and inter-area movement of population since 1947. The invasion by Pakistan brought about some quasi-demographic changes which seem to be permanent now. The pace of economic development on the Indian side of the ceasefire line has been a factor of importance in human adjustment to the changing environment. This development has been brought about by a free distribution of fertilizers, loans for rehabilitation, opening of roads, subsidy for the development of cottage industries, distribution of cultivable land, abolition of absentee landlordism, free education, medical facilities and the association of people in development plans. Local administration through panchayats and cooperative societies has given confidence to people for whom avenues of employment have also been opened.

There has been a considerable increase in the working population of the State. The figures for 1976-'77 are given below:

Working Population in Jammu and Kashmir 1976-1977

District	*Working Population*	*Cultivators*	*Agro-labourers*	*Non-agro workers*
Anantnag	2,58,922	1,86,722	8,158	64,042
Srinagar	2,38,979	96,619	6,156	1,36,204
Baramulla	2,40,913	1,76,197	8,301	56,415
Doda	1,23,493	93,406	1,561	28,526
Ladakh	46,077	35,782	1,376	8,919
Udhampur	7,05,717	78,715	1,836	25,116
Jammu	1,78,871	86,960	9,567	82,344
Kathua	73,390	46,698	3,750	22,942
Rajauri	61,106	48,611	629	10,866
Punch	47,433	40,281	599	6,553
Total	13,73,901	8,89,991	41,953	4,41,977

FACTORS AFFECTING THE DENSITY OF POPULATION

Relief

Relief features directly affect the distribution of population in the State of Jammu and Kashmir. Most of the area in the district of Ladakh is a barren waste. It is wild territory with lofty mountains and deep valleys all of which drain into the river Indus. Very little available land and hard conditions of climate have retarted the growth of population. The density of population is only two and the only urban settlement worth mentioning is Leh, with a population of 5,519 (1971).

The south-west region of the State with its river system and cultivable land has helped the growth and distribution of population. The valley of Kashmir consisting of the main valley of the river Jhelum and its tributaries on the east and west provide some scope for cultivation. The soil is fairly rich in organic and inorganic constituents and the land from 1,524 to 2438 m above sea-level is mainly used for rice cultivation. There is no problem of irrigation as melting ice on higher elevations provides sufficient water. The Karewa soils also promise a harvest of maize and some fruits like almonds, apples and pears.

Since the opening of the Jammu-Pathankot Road, the railway to Jammu and the construction of canals and wells in the dry-arid belt of the Outer Plain and the Outer Hills, settlement has steadily spread. Town area settlements have sprung up at Akhnoor, Basoli, Kathua, Lakhanpur, Nowshera and Rajauri. The entire trade of Kashmir passes through the tract of this undulating territory bordering the Outer Hills. In the north-eastern part of the State there are many small river valleys which provide patchy settlements in Baltistan in the lower part of the Shyok, the Shigar, and the Indus.

Climate

It is admitted that distribution of population has a direct bearing on the factors of climate, particularly precipitation and temperature. In the territories of Jammu and Kashmir snow and rain give a definite character to the demographic pattern. The span of height ranges from 304 m above sea-level to 8,615 m within a short latitudinal expanse of 480 kms. There being no single system of winds, moisture has different sources of origin. There is, thus, no gradation in precipilation as in the rest of the country. The monsoon even though exhausted, causes a rainfall of 52 inches at Kathua, 62 inches at Basoli, 46 inches at Jammu and 38 inches at Akhnoor. For the entire province of Jammu, the average rainfall has been calculated at 52.46 inches which appears a little high because of precipitation in the Outer Hill region.

The Middle Himalayas beyond Udhampur, Ramban, Doda, Bhadrwah and Kishtwar have a rainfall of 72 inches, 64 inches, 58 inches and 45 inches respectively. The rising altitude in this mountain tract with deep gorges of the river Chenab and its tributaries has very little land suitable for cultivation. Therefore, population has settled in a patchwork of settlement on small alluvial lands. Agricultural workers constitute only three percent of the population in the district of Doda consisting of the *tahsils* of Ramban, Doda, Kishtwar and Bhadrwah. Forestry provides work and opening of roads absorbs labour.

In the valley of Kashmir the surrounding mountains hold the snow "treasuries" for summer where with the shift of the thermal eqator in March, mountain streams provide water for irrigation. There is hardly any part of the valley and its high surroundings from 1,524 to 2,133 m above sea-level which can be termed as uninhabited. Agriculture, in one form or another, spreads all round and the extent of cultivation is widening to the higher elevations with fruits.

Trade and Transport

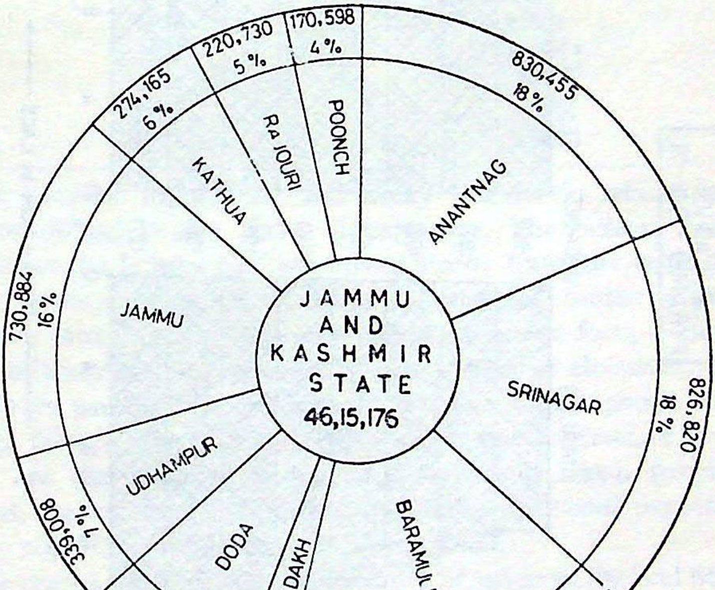
Trade and transport may be considered as a factor of permanent and quasi-permanent settlement. So long as mountain routes remained open across Baltistan to the lofty Karakoram and the province of Sinkiang, caravans carefully traded across the river Yarkand. Patchy settlements sprang up at Khaplu, Shigar, Rupshu and Deosai. Mostly bridle-paths on the right bank of the river Indus and the mountain routes to Leh in the east and Gilgit in the west remained busy with merchandise from across the geographical frontiers of India. The trade in this tract was brisk. It is only to the north and west of Gilgit that advancing glaciers provide ice-cold water to the patchy settlements of cultivation in Baltistan at Hassanabad, Murtazabad, Askardu, Aliabad, Hunza, Baltit, Khudabad, Misgar, leading to the Kilik Pass up to the Tagdambush Pamir.

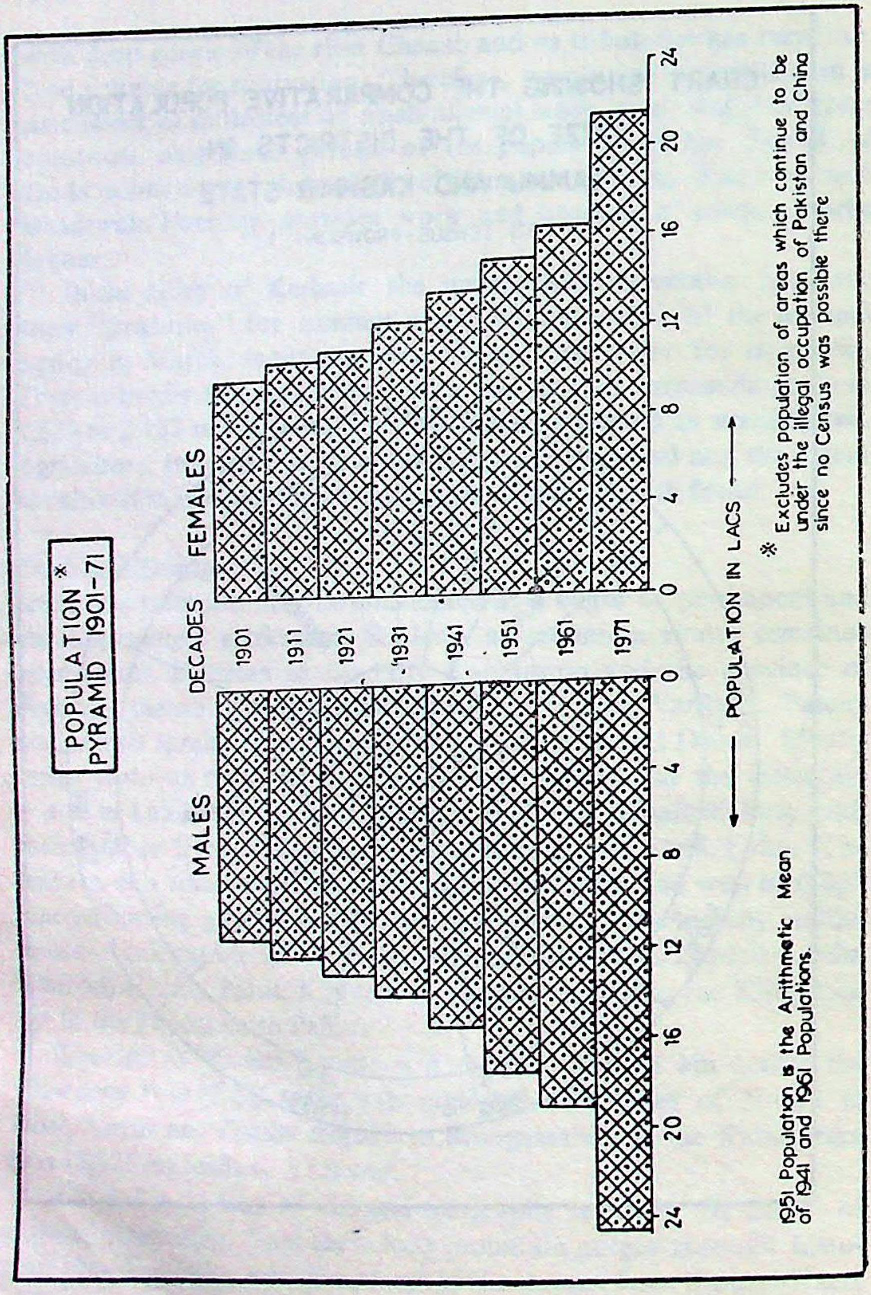
The Leh to Yarkand route is a distance of 763 km across the Khardong Pass (5,234 m high) through the small valley of Nubra to Kizil, Angur and Daulat Beguldi to Brongassa where the Karakoram Pass (5,325 m) leads to Yarkand.

It is for a student of cultural geography to study the trends of cultural penetration from these lofty mountain gorges through historical time beginning with the march of the Aryans from the arid tracts of Central Asia. The advances in science and technology, however, influence the distribution of population minimising steadily the wrath

CHART SHOWING THE COMPARATIVE POPULATION SIZE OF THE DISTRICTS IN JAMMU AND KASHMIR STATE

(1971 CENSUS - PROVISIONAL)





1951 Population is the Arithmetic Mean of 1941 and 1961 Populations.

* Excludes population of areas which continue to be under the illegal occupation of Pakistan and China since no Census was possible there

of nature shown in aridity and difficult terrain as in the Outer Plain, the Outer Hill region and the wild territory of Ladakh. Air-borne traffic, use of chemical fertilizers, new seeds and opening of roads will in future influence the distribution of population in the territories of this sensitive border State of the Indian Union.

Employment in the private sector is at an increase and the scope is widening as shown in the table below:—

Jammu and Kashmir State
Employment in Private Sector - 1977

Year	
1971	6,100
1973	6,336
1975	6,612
1976	6,845
1977	8,584

The peculiar topography and tricky weather in winter creates transport difficulties and makes it expensive. The railway link has extended to the Jammu city wherefrom motor transport remains the life-line serving the needs of trade, industry and tourist traffic. Air transport, though being an important link, does not form a common carrier of trade and passenger traffic. Its expensive character further restricts its use for transporting cheaper and heavier goods. Among cultural factors which have a bearing on the distribution of population are the types of economic activities in which people are engaged, the techniques of production, the form of social organization and the objectives which society seeks to attain.

The census for 1971 will conveniently be taken as the real field for the study of demographic trends in the State of Jammu and Kashmir with all its shrinkage in area from time to time and mobility of population.

The following table shows the population growth during 1961 and 1971.

Population of Jammu and Kashmir State, 1971

Population	*Males*	*Females*	*Females per 1000 males*
4,616,632	2,458,315	2,158,317	878

The sex ratio has, however, remained unchanged in the State of Jammu and Kashmir during the period 1961 and 1971. It stands at 878 females per 1000 males. The highest sex ratio, however, continues to be in Ladakh district with 975 and lowest in Anantnag and Baramulla districts where it stands at 848.

RURAL-URBAN TRENDS

According to the Census 1971 the rural population of the State of Jammu and Kashmir is 3,758,411 and 858,221 as urban. It works out at a percentage of 81 rural and 19 urban to the total population in 1971.

The number of towns in the State is 45 and their classification according to population in 1971 is as under :

Categories Of Towns in Jammu and Kashmir State, 1971

Class	*Population*	*No. of towns*	*Density per square km.*
I	100,000	2	3,443
II	50,000 to 99,999	Nil	—
III	20,000 to 49,999	3	2,166
IV	10,000 to 19,999	3	3,479
V	5,000 to 9,999	17	1,210
VI	Less than 5,000-80	20	521

It is clear from the above classification that urban growth in the State is not uniform. It may not, therefore, be possible to have a rational view of the demographic trends after 1971. The tapestry of increase and decrease is confusing since new areas have been added, number of villages transferred from one district to the other, urban limits extended and many jurisdictional changes effected.

There is no class II town, thus no urban settlement comes within 50,000 to 99,999 in 1971.

In class III Anantnag was the sole representative in 1961 but during the past decade two more towns Baramulla and Sopore have also come up in this grade. These two towns are also of industrial and commercial importance being centrally located. There are some important adjoining centres of cottage industries and consumer goods. These three towns have a potential for an agro-industrial base. In class IV (10,000 to 19,999) there are only three towns as against four in 1961. These are Kathua, Punch and Udhampur. Baramulla and Sopore attained class III and Kathua came up in grade because of its being on the National Highway and as the first railway station in Jammu with industrial and commercial set up. Besides the Chenab Textiles, Mehra Textile, gun manufactures. cable mill manufactures, rice, flour, ice, cold storage mills, etc. during recent years. With the opening of these plants the regional transportation has increased.

There were only six towns in class V and three towns in class VI in 1961. In 1971 the class V registers seventeen towns and class VI twenty towns. In class V (5,000 to 9,999) eleven new towns have made up the grade from class VI. These are mostly *tahsil* headquarters or like Bijbihara and Pampur situated on the National Highway. In class VI there were thirty towns in 1961. During the decade 1961 to 1971 the number came down to twenty, out of which fourteen continue in this class from 1961 and only six new towns have been added. These are : Chenani (1,343), Kokerṇag (1,723), Surenkot (1,822), Pahalgam (2,335), Kargil (2,390) and Mattan (4,771).

The urban pyramid appears without any proportion between classes since III and IV are uniform in the middle and class V and VI do not show much variation. At the top class II has little possibility of any urban settlement since 23,000 is the approximate average total not much above half of 50,000 in class III.

The two urban agglomerations of Srinagar and Jammu account for 43 percent of total urban area in 1971 as against 22 percent in 1961. The increase of about 100 percent is due to industrial activity during the last ten years.

The area increase in class III and decrease in class IV towns is attributed to the moving up of Baramulla and Sopore towns from class III in 1971.

The increase in the area of class V has been attributed to upgrading of class II and VI towns in 1971.

There has, however, been a heavy fall in class VI towns due to elevation of class II and VI to class V in 1971 and elimination in 1971 of a number of places regarded as class VI towns in 1961. Density of population per square kilometre in case of Class I towns

(Srinagar and Jammu) is clear due to amalgamation of many rural areas with the city to avoid congestion and provide better conditions of living.

The increase in population during the decade (1961-1971) is recorded at 29.65 percent. It is the highest ever recorded. The causes of the highest growth rate are eradication of epidemics, improvement in the medical facilities, sizeable immigration and general economic prosperity.

Anantnag district records highest growth rate in the last decade and the district of Ladakh the least. The only two towns in category I are Srinagar and Jammu containing 65.11 percent population belonging to the urban areas.

1971 Census

	Growth rate	*Population*
Srinagar	41.42%	402,413
Jammu	51.20%	155,338

The Muslim population has increased in 1971 being 304,029 as against 2,432,067 in 1961. The Hindus being 1,404,092 in 1971 as against 1,012,193 in 1961. The following table gives classification by religion.

Population By Religion

Religion	*Population*		*Percentage to total population in 1971*
	1961	*1971*	
Muslims	2,432,067	3,040,129	65.8
Hindus	1,012,193	1,404,292	30.4
Sikhs	63,069	105,873	2.3
Buddhists	48,360	57,956	1.3
Christians	2,848	7,182	0.2

In literacy there has been a fairly good rise from 11.08 percent in 1961 to 18.30 percent in 1971. It is the highest in any of the States, the percentage for the whole country being 22.14 percent.

Srinagar (34°5′ N—75°52′ E) is the core of the Kashmir Region and the State. On the river Jhelum and the Dal lake it is by far the largest city of Kashmir with sufficient attraction for the tourists who enjoy its scenic glamour of land and water. As a regional focal centre this ancient city prospered through historical time. The population of the city in 1971 was 189,470 including Badamabigh Cantt. Srinagar is known for its world-famous handicrafts, shawl-making, wood carving, embroidery, leather works, carpets, etc.

SRINAGAR

Srinagar (1,588 m) since its inception in 300 B.C. by Ashoka remained the principal city of Kashmir whose history has always been reflected as it were in that of its capital, which has not changed its site for more than thirteen centuries. During the last three decades Srinagar expanded as an urban settlement till it covered 82.88 sq. kms. in 1971, as against 28.49 sq. kms. in 1941. In population, too, it has grown from a strength of 2,07,787 in 1941 to 4,03,413 persons in 1971.

The city has expanded faster during the last two decades and added about 13 sq. kms. to its urban area by absorbing Theed, Chashmashahi, Dar-Bag, Zeethyar, Nowpora, Gupkar and Hasthil. Karapora Abi and Hazratbal on the lake now a university area with an engineering college is mostly inhabited by visitors and tourists. New residential colonies have been added with modern facilities, even then the city has several congested areas presenting an appalling appearance. Modern building material is ousting the old carved wood architecture. To a great extent fire is under control but floods cause havoc still. Average dwelling in the city is a three-room set. A majority of the buildings are built of burnt bricks, and about 41 percent dwellings are covered by shingle as against about one-third with roofs of corrugated iron sheets. Though haphazardly grown the city has some functional areas. The Lal Chowk (the Red Square) is the main business centre with roads running east-west. The Bund along the bank of the river Jhelum, hotels, hospitals, educational institutions are concentrated in this area.

JAMMU

The city of Jammu (32°44′ N—74°55′ E) is a typical foothill urban centre located to the south of the Pir Panjal. It commands strategic importance as the National Highway, leading to the valley of Kashmir and beyond, passes through this city founded by Jambu Lochan, a scion of the Solar dynasty of Ayodhya. The sloping hill has ridges cut through by the narrow valley of the river Tawi flowing out to the plain 60 m below the hill 60-90 m above the plain. With its urban limits extending towards the west, north-west and south the medieval gates now in ruins have lost importance. A fort protects the city across the river Tawi wherefrom the steep escarpment of the boulders lead to the east forming the municipal limits. Quite high above the flood level the city lies on a high terrace of boulder conglomerates embedded in clayey silt forming the western and northern bank of the Tawi for about 3 km. Thus known as *wattan wala Shahr*, a city of rounded boulders it presents a field study for weathering by running water.

Jammu is linked by railway now and the railway station across the Tawi to the south has encouraged new settlements. With recent urban expansion, Jammu has added many localities like Nai Basti, Digiana, Gol Gujral, Akali Sant Nagar, S. Kohar Singh Nagar, Industrial Estate. The Jammu-Pathankot road along which the 66 miles railway line runs will remain the main spine for urban expansion.

The population of Jammu City in 1971 was 155,225 (males 84,494 and females 70,731) with a growth rate of +51.09 percent from 1951-1971.

The focus of the urban hub extended southwards from Dhounthli to Jain Bazar and then to the Raghunath Bazar which continues to be the fashionable market of the city and because of ill-planned and narrowly congested settlement towards the elevated purani mandi, is termed the Drawing Room of Jammu. The residency road limited by the river Tawi connects itself with the interior through lanes which from an intricate system of routes for movement of men and goods. The development of the Shastri Nagar, Gandhinagar and the Railway colony puts a premium on the extending urbanization to the south.

LADAKH

The district of Ladakh has an area of 37,753.8 square miles according to the Director, Map Publications, Dehra Dun (U.P.). Out of this area 3.5 square miles alone are urban. There has been an increase of +18.8 percent in population from 1961 to 1971. Rural population has increased by 14.7 percent and urban by 112.6. There are 975 females per 1000. With 235 villages in the district the distribution is as under:

Tahsil	*No. of villages*
1. Leh	108
2. Kargil	102
3. Zanskar	25

Leh (latitude 34°2′ North aud longitude 77°6′ East) is the only urban settlement in an area of 9.15 sq. km. and a population of 5,519 (males 2,865; females 2,654) in 1971. The highest town of the world at 3,365 meters is a route town for Tibet, Yarkand, Sinkiang and Chinese Turkistan across the border. The roads connect Leh with Skardu and Zoji La. The aerodrome at Leh has regular air links with Chandigarh, Srinagar and Delhi.

Another urban settlement in the district of Ladakh is Kargil, 2.14 sq. km. in area and a population of 2,390 (males 1,396 and females 994).

The State of Jammu and Kashmir constitutes 0.89 percent of the total population of India ranking the sixteenth among the 29 States and other centrally administered areas.

ECONOMIC AND POPULATION POTENTIAL REGION

As a pilot study the district of Srinagar has been taken up for an economic and population-potential region in the State of Jammu and Kashmir. The potentiality of population is one of the most dynamic spatio-temporal characteristics in geographical analysis of any region. The State of Jammu and Kashmir is not rich enough in its population resources, as far as its spatial dimensionality is concerned. The probabitity of population growth and distribution may well be exhibited by the help of the potential concept of population.

A mathematical model can be developed on the basis of demographic and geometrical centres of the areal units.

The case study of Srinagar district in this context is a typical example to illustrate population complex.

Tahsil-Wise Population, 1971

Tahsil	*Potential Unit*	*Population*	*Population for Computation*
Srinagar	P_1G_1	463,879	464,000
Ganderbal	P_2G_2	94,785	95,000
Chadura	P_3G_3	98,042	98,000
Badgam	P_4G_4	92,795	93,000
Beerwah	P_5G_5	78,196	78,000

The calculation has been done from P_1G_1 unit to P_5G_5 unit on the basis of following models:

For Unit P_1G_1—

$$Pi = \frac{(Pd + Pd + \ldots pd) + (PG + PG + PG \ldots PG)}{2}$$

For Unit PG

$$Pi = \frac{(Pd + Pd + Pd + \ldots Pd) + (PG + PG + PG + PG)}{2}$$

The series of models represents:

P to P = Population of the units PG to PG
d to d = distances to demographic points d to d
G to G = distances to geometrical centrrs G to G
n = Number of units taken into consideration.

The calculation for unit PG has been done as follows:

$$(464000 \times 1) + (464000 \times 30) + (464000 \times 55) + (464000 \times 60) + (464000 \times 40) + (464000 \times 1) + (464000 \times 30) + 464000 \times 55) + (464000 \times 60) + (464000 \times 60)$$

$$\frac{P = 53000 + 85{,}400{,}000}{2_n} = \frac{1384}{2 \times 5} = 138 \text{ per km.}$$

The population potential for Srinagar (PG) is 138 lakh per km.

For second unit PG of Ganderbal the population potential index comes to 29.30 lakh per km. In this series of model we replace the population units denominator P in place of P, Likewise each new unit has its own denominators P, P, P . . . P according to units under consideration.

The graphical method of population potential has it own utility. In it the linear distances are indicated by the term d and G for each centre of demographic/geometrical gravity.

Population Potential (1971)

Tahsil	*Potential Unit*	*Potential Population per/km*
Srinagar	P G	138.00 lakh per/km
Ganderbal	P G	29.30 lakh per/km
Chadura	P G	34.10 lakh per/km
Badgam	P G	32.50 lakh per/km
Beerwah	P G	21.00 lakh per/km

On this basis, the isoplething has been done. The isopleth has been drawn on the index ratio of 35.00 lakh per sq. km and above; 34.00, 35.00, 32.00-34.00, 28.00-32.00 and 28.00 lakh per sq. km.

The highest population potential zone covers Srinagar *tahsil*, a part of Badgam and Chadura tahsil. The lowest population potential zone forms the arc-shape area, on the outskirts on district Srinagar. The arc-shape zone covers Ganderbal, Beerwah and small parts of Badgam-Chadura tahsil.

THE GRAPHICAL TECHNIQUE*

The advantage of the potential population concept lies in its rational generality of understanding characteristics of population in spatial context. It helps us in visualising growth and distribution pattern of population in future. In population-resource planning such studies will be of help to the planners and administrators.

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*The district map cannot be enclosed for obvious reasons.

Chapter XIV

MEDICAL GEOGRAPHY

INTRODUCTION

A study of the geography of life and death in the state of Jammu and Kashmir aims at explaining the causes of disease. The pattern of death in its relationship with environment, particularly climate, reveals many facts about mortality.

In Asia the problem of health and disease deserves particular attention in view of the prevailing low standard of living with a large percentage of deaths caused by some of the "worldkillers" like the malaria, tuberculosis, typhoid and cancer.

In India the problem of living longer and happily figured prominently in the Five Year Plans. The problems of disease and malnutrition, therefore, formed a basis for medical research.

HISTORY OF TRADITIONAL TREATMENT

A noteworthy feature of the Government of the State of Jammu and Kashmir after the year 1947 was to extend its range and quality of medical service to the people. Training in the laws of preservation of health, sanitation and hygiene were attended to with some care. Subsidy to allopathic, *unani* and *ayurvedic* practitioners was also of helf to the rural population in remote parts of Jammu, Kashmir, Ladakh and Gilgit. In the year 1944-'45, the number of patients treated in the government institutions including the *ayurvedic* and *unani* dispensaries was 149,875 i.e. about 33 percent of the total population.

There are reasons to believe that herbs for use as medicine were known, as revealed in some ancient Sanskrit texts. The cure of disease and influence of climatic factors on life appear to have been studied seriously. From a close and careful study of some rituals it transpires that food habits changed according to seasons. It justifies the view that divine visitation was not to be borne by God's will.

Disease was due to causes that could be effectively remedied, besides medicine, even by a change in environment. With the change in seasons articles of diet also changed to suit weather conditions. Not only in urban areas but in the remote countryside, too, the change in habits of diet was common. A study of cause and effect went so far that experiments in the efficacy of plants, herbs, cereals and fruits was seriously taken up in the past. W.R. Lawrence observes, "the Kashmiris turn nearly every plant and tree to some use and attribute medicinal properties to every thing."

The indigenous system of medicine is still followed extensively, the old exercise their wisdom and experience in the treatment of disease. The leaves of plant known as *Zonia* is mixed with butter for strengthening the hair. Head-lice are destroyed by the use of washes made from *Euphorbia. Thosonian* (*Hirbi*), *Aconitum Sp.* (*Manirahdig*) are also used for this purpose. *Corydalis falconeri* (*At nil*) is used to induce curliness of hair. Hot water with a little salt continues to be a home remedy for all abdominal ailments. The use of medicinal plants is believed to be common and effective, to the chagrin of bourgeois standards of treatment advocating patent drugs.

The *Gujjars* and *Bakarwals* moving in fresh air on higher elevation with their flocks of sheep and goats feed on goat's milk and butter. Meat cooked mostly in fat mixed with onions forms a rich protein diet imparting vigour and longevity. Iodine deficiency goitre, deformity of bones, tuberculosis and cancer are common. Skinny and bony hands is a common sight at the Alpine meadows (*marags*) in the Panjal mountains at Shopyan, Arihal, Udhampur and Rajauri.

Diseases vary with altitude and their causation could be mapped to prepare research tools. Such maps could show prominently some of the urban and rural diseases responsible for mortality.

The *unani* system of medicine retained its popularity until recently and is even now popular in rural areas. *Aruqs*, distilled water collected from evaporation after boiling medicinal herbs is prescribed even now for certain diseases. The research for elixir to prolong life and retard aging, known in Sanskrit as *Rasayana*, infected the Arabs travelling through India. They continued the process of chemical research and the great Arab alchemist, Ibn Hayyan was familiar with the Hindu *Rasayana*. The translations of the Sanskrit texts in the famous Arab Encyclopaedia—*Kitab-Ul-Fehrists*—was a contribution of the Arabs.

The *Unani* system suited people as it was not only cheap but also paid due regard to the temperament of the patient. It is to be admitted that the *Unani* treatment is not mechanical as it depends on exercising the imagination in prescribing medicine and above all the treatment is dietic which imparts discipline to the patients. One now realises the value of the *Unani* way of building up health by taking goat's raw milk, dates and raisins. In those days, too, there was a good natural nourishment of vitamins, iodine, sulphur and potassium. Ripe fruit and a variety of vegetables was available in abundance.

In Kashmir cholera caused havoc in the early years of the present century. In winter deficiency of food and poor clothing resulted in ailments in the valley of Kashmir but not at high altitudes where complaints of liver and several ailments are more common with a marked deficiency in vitamin D.

The use of dried vegetables like the brinjal, turnips, radish, *knol-khol*, dried and seasoned fish, pulses and beans was common in winter months. Spices like ginger, pepper and turmeric cooked in seasamum oil impart taste to the dish. Rice, maize and buck-wheat form the staple food accordingly as the altitude rises. The maize-eating population suffers mostly from pellagra and polished rice creates a deficiency of vitamin B resulting in beri-beri.

A BALANCED DIET

If the human body is to sustain itself in this age of breakneck speed and nervous tension it has to be provided with a properly balanced diet. The problem of food and health is, therefore, a related one and should be subjected to a thorough research study.

In recent years, it is true, that some foods have been discarded, may be to the detriment of general health. At certain altitudes and in some areas weather conditions may demand more of carbohydrates and less of protein and vice versa. Such medico-geographic studies could draw up the needs for a balanced diet in various types of physico-climatic environments.

The present day diet may suit health only if the intake of iron is assured through apricots as in the Jammu province and spinach, green turnips and whole wheat bread as in the Kashmir valley. In Ladakh dry fruits from Gilgit normally make up for the iron deficiency.

Even though needed in minute quantities, vitamins are essential. Such items are normally provided by butter, tomatoes, potato, spinach, turnip, carrots and eggs. All these are available in Kashmir and Jammu provinces. Vitamin B is contained in yeast, rice bran, liver and eggs. Hand milled rice has plenty of thiamine ; as such its deficiency is no problem in rural areas of Kashmir where machine-husked rice is not in common use yet. In the province of Jammu wheat bread is made with yeast which increases its content of protein and vitamins.

Leafy vegetables are taken by all in one form or the other as a staple item of diet.

In the Outer Plain, Outer Hills and Middle Himalayas sprouted green gram (*Mung*) is a very good source of vitamin C and is commonly used in the countryside. Amla, oranges, lemons and guavas are also rich in this particular vitamin.

Liver, liver oil, eggs, milk and clarified butter (*ghee*) make up the deficiency of vitamin D. For children who have any deformity of the bones as a result of this deficiency, exposure of the body to sunshine, is the cheapest way of cure. In severe winter when movement is not possible children remain indoors when sufficiently liver oils, eggs and clarified butter (*ghee*) is necessary. Not so in the province of Jammu where there is sufficient sunshine and dryness.

Proteins pose a problem of their own. Severity of winter and a frosty covering of the soil necessitated the use of meat, fish and eggs in Kashmir. From early times meat and fish entered the *Tantric* rituals with yeasts of many kinds—all proteins. The use of spices helps in imparting taste and flavour to food. Fish, being perishable, is sold at cheaper rate than meat. These two provide the main protein food to the people of Kashmir where the lakes (Wular, Dal and Anchar) together with the river Jhelum and its tributaries provide a rich source of of cheap fish. In recent years, to makè up for protein deficiency, fish-flour has been introduced in the diet of 300 million people in USA. According to ex-Vice President Hubert Humphrey fish flour is "the greatest boon to mankind to help to give him a sound mind, since, I guess, the beginning of times."

Natural sugars require very little effort in digestion. These are quickly absorbed by the system and are necessary for health. Milk and fruits contain natural sugar but dates are also a good source.

Dates are taken in the Outer Hills and the Middle Himalayas but not as much in the valley of Kashmir. Dates known as "sunlight in storage" form an important part of diet in the Inner Himalayas and the Outer Plain.

A balanced diet is essential for the promotion of health and prevention of diseases that rob people of the joy of life. Statistical information should therefore, be collected to show where and how in the different territories of Jammu, Kashmir, Ladakh and Gilgit people die young. The causes for this should be studied and respresented cartographically, and the evidence acted upon to identify the varied requirements of diet in different districts.

Salt-tea with milk is still used early in the morning in rural Kashmir. To many abdominal ailments particularly stomach ulcers, this kind of tea is of benefit. According to some medical experts this salt-tea is the secret of good health in rural Kashmir. The lunch consists of cooked rice, meat and vegetables cooked with mustard oil and spices. Maize and wheat form the staple diet on the Karewas forming about one half of the area of the valley. On these lacustrine highlands rising even up to 400m above of the valley (1,828 m above sea) beans and turnips also enter into the diet. Walnuts provide sodium, sulphur, potassium and iodine besides fats.

Medical geography could prepare climographs to determine 'comfort' in human reaction to climate as explained by the late Professor Griffith Taylor. Considering variations in environment and operation of microclimates, a study of climate, and economic development in the valley of Kashmir is useful even if the criterion for the healthiest place would be where people live the longest.

An area of more than one hundred square miles is termed the water bodies of the valley of Kashmir. It consists of the Wular lake, Dal lake, Anchar lake, Mansbal lake and other river streams and canals. Population over these water bodies is concentrated towards the river banks and shores of the lakes where they live mainly in boats. The standard of health of this floating population varies in a degree from others as their habitat and diet differ from those who live on land. From the lakes the people obtain water-nuts (*Singhara*) and lotus roots (*Nadru*) for their use.

To those who are interested in Medical Geography of the State of Jammu and Kashmir, it may be pointed out that there is no problem of rural slums in the valley of Kashmir. For winter warmth a single room 'Fug' may still be in use in some parts of the valley at high elevations but not in towns where facilities of construction have raised the standard of housing and ventilation.

Medical geography could do some service in preparing maps, charts, and diagrams showing variation in temperature, humidity, sunshine and pressure in these mostly mountainous territories of the State of Jammu and Kashmir where microclimates operate as the altitudinal rise is so sudden on all sides. In the elevated region of the Stàte the atmospheric pressure, and consequently the relative pressure of oxygen, is very low. This results in a number of geo-medical problems including the high altitude sickness.

There is a regular health service in the State of Jammu and Kashmir. The following table shows the extent of health services.

1976-'77

Health Service	*Number*	*Number of Beds*
Doctors	1354	
Nurses	476	
Midwives	129	4,940
Compounders	759	
Dais	348	
Vaid/Hakim	487	

Chapter XV

THE CULTURAL LANDSCAPE

Here indeed is the spirit of India
Purged from the dross of creeds

Maud Diver

The entire territory of the State of Jammu and Kashmir continues to be rural with its 6,742 villages in 1971. In 1901 the number of villages was 6;836. Most of the 45 towns now termed urban are still glorified villages. With 81.41 percent of rural population this Himalayan region is the repository of many streams of religio-cultural nature. This has resulted in a harmonious mingling of a composite character which has stood the test of time. As a land of Himalayan routes across the Pamir, Aksai Chin and Karakorum ranges to Russia, Tibet and China, caravan after caravan kept alive travel, trade and culture from Misgar to Gilgit and Leh to Sinkiang. The main routes of cultural and commercial intercourse between India and Central Asia during the ancient times passed through the beautiful valley of Kashmir. The diffusion of mainly three religio-cultural streams—Hindu, Buddist (Tibeto-Mongoloids) and Muslims—harmonized into a faith in common ideals.

THE VILLAGE

The rural habitat ranges from logwood huts on Alpine glades of Kashmir Himalayas to wood and thatched dwellings of nomadic graziers, the *gujjars* and the *bakerwals*. On the waterways villages sprang up in the valley of Kashmir and most of the longitudinal 'duns' in Siwaliks Jammu. The opening of roads altered the settlement pattern when roadside villages assumed prominence. Mud bricks were replaced by baked bricks and mortar (clay and husk). These imparted durability and form to the dwellings. Social forces influenced local environment and economic links gave rise to interdependence till the village as a settlement unit formed its different sectors of potters, blacksmiths, cobblers and traders. The temple, mosque and monastery became the nucleus for social intercaste. Steadily, the growth of villages resulted in further concentration in *mohallas* of respective and special trades like that of the weavers, the goldsmiths, cobblers, the carpenters and the like. On the banks of the lakes and on some of the prominent waterways, fishing formed a settellement pattern of villages with small boats, spears, nets and hooks. These coastal villages near the Wular, Dal, Anchar and other lakes and confluence habitations like Shadipur (Kashmir), Akhnoor (Jammu) and Leh (Ladakh) have their own place in the settlement hierarchy.

The rim-village is a feature of settlement actively engaged in the work of timber extraction from the forests. More hardy and adventurous than the farmer these villagers widened their scope of extension towards the link roads connecting the main road leading to the urban market. Such villages form rural settlements as seen in Chakla, Nadihal (Baramulla), Handwara, Qazigund, Verinag, Shopyan (Kashmir), Kishtwar, Doda, Billawar and the entire Outer Hill region of Jammu.

An increase in population and socio-economic facilities brought about a transition in the villages. These grew up to form the future urban nucleus. Such transitional settlements between the forest and the agricultural economy, flanked the lower Karewas as Badgam, Kulgam, Pattan, Mattan, Baramulla, Anantnag in Kashmir and Akhnoor, Kathua, Samba, Hiranagar in Jammu. The growth of urban towns known as *Kasbas* created market places where facility of communications, nearness of waterways and availability of credit facilities stimulated economic and commercial activity.

In this State of the Indian Union the socio-economic fabric suffered a change after 1947 when the Jhelum Valley Road was blockaded by Pakistan. The entire direction of trade and travel concentrated across the Pir Panjal through the Jawahar Tunnel and the foothill town of Jammu. The opening of link roads and the new National Highway from Srinagar to Pathankot exerted a gravitational pull on urban settlements and industrial and commercial establishments in its proximity.

The Jhelum river may be taken as the most significant single factor in the urban growth of the valley of Kashmir. The Jhelum (vitastā) is more than a river. It is a goddess whose birthday is celebrated on the thirteenth day of the bright fortnight of Bhadun (August-September). With the ease of transporting goods in boats, in particular, flowing of timber downstream and availability of sufficient water supply through out the year, this main highway of the land has concentrated population in townships.

The city of Srinagar, built by Asoka, spread itself on the two banks of the Jhelum in Srinagar where the slopes of two hills of Shankaracharya and Hari Parbat provided places of escape and safety in floods. Settlements extended towards these elevations from time to time and clustered cottages in times of emergency sprung up and later on developed into hamlets as at Gopkar, Theed, Hārwan, Dara, Hari Parbat (inside the fort) (Kalāi Ander) and Drugjan. The general build of the city was based on "fresh-cut pine". This supports the view of Kalhana that the houses were lofty which was only possible with cantilever order of beams of deodar and pine. Even today some of the ancient monuments bear this out. The deodar temple at Kaikut, supposed to have been built by one Raja Majan about three hundred years ago has the *Brahmi* characters. Long before his time inscriptions on temples, old coins and the art of building must have been the work of thousands of years of learning, preparation and experience.

The rise of Northern Buddhism gave Kashmir a pivotal importance as the base for spread of Mahayana Buddhism. Missionaries from here (*Bhikshus*) spread towards Tibet, China, Kabul, Kandhar and Bactria. There were 60,000 villages in the valley, all abodes for meditating monks in the blue forests of Kashmir as stated by the Buddha himself. This geographical extension of the new Buddhist doctrine had to convince and convert the Indian mind dominated by Hindu philosophy. Even in the time of Ashoka when 5,000 monks were taken to Kashmir to propagate the doctrine one wonders what the urban character should have been. The route along the river must have had many halting stations. Thousands of scholar-monks reached *Kundalvan* where the Buddhist Council was held near Srinagar (may be modern Kuntlun on the Zuberwan Spur) as suggested by some writers.

Hiuen Tsiang entered Kashmir from Urusha (Hazara) in the west and spent two years (May 631 to April 633) learning *sutras* and the *shastras*. Hinting at warring princes on its four frontiers the great pilgrim speaks of enormous intellectual activity with more than hundred centres of residential learning with a strength of about 10,000 scholars coming and going resulting in brisk activity, intellectual and commercial, making this land cosmopolitan with world travellers, visitors, writers and thinkers. The Zojila route was the highway leading to Tibet (Tou-fan) and the Po-liu (the Gilgit Road of today). The Graeco-Buddhist art in the entire north-western India two kingdoms of Kashmir and Gandhara, architects, sculptors and artisans, in urbanization not alone within the valley of Kashmir itself but on its borders wherefrom trade in goods and thought was carried on. Kalhana speaks highly of the building activities of Ashoka and the foundation of Srinagar in his time with "ninety-six thousand dwelling houses resplendent with prosperity" besides numerous *Vihāras* and Stupas near Sukseletra and Vitastrata (74°42′ longitude, 34° latitude).

Construction seems to have been brisk in this reign with the use of stone more common. Commercial activity seems to have been brisk on the north and north-western borders of the territories as is clear from the Greek accounts of Alexander's invasion when Kashmir-Gandhara was excluded from the attack, as it was under the chief of Abhisaras (Poonch and Nowshera districts) who diplomatically avoided the Hellenic ouslaught by accepting the overlordship of Alexander Nikator.

The village was known as *gram* (a Sanskrit word). Today in Kashmiri, a modified (*gam*) is used. But a significant fact is that the village acquired its name by the nearby springs known as *Naga*, the snake round which legendary literature sprang up of which the *Rajtarangini* is replete. According to James Fergusson these *Nagas* were not originally serpents but worshippers of serpents. According to Dr C.F. Oldham the *Nagas* claimed descent from the Sun and had the hooded serpent for a totem with Takshachilla (Texila) their chief city.

The scanning of historical evidence reveals a period of struggle between the Nagas, original dwellers of the land with the Aryan settlers. There are numerous villages with the syllable suffix or prefix as Vicharnag, Nagbal, Nagdandi, the lord of Kashmir Nagas (Nilnag).

PLACES, NAMES OF VILLAGES

A knowledge of Sanskrit helps trace the meanings of the names of villages. The common affixes are Bug, Hama, Mula, Nagri, Hol, Gul, Than, Yera, Zar, Waji. These Sanskrit names are believed to have been corrupted by Todar Mal in his list of villages prepared for Emperor Akbar. Foreign notices and indigenous records show how far original Sanskrit names suffered etymological changes found in early Chinese notices of Ou-kong and Hiuen Tsiang.

The Greek and Chinesc notices were later followed by Muslim travellers for whom geography was a living study. Alberuni's contribution is based on the information given to him by Kashmiri scholars. There is very little change in Sanskrit names used by Alberuni.

Kalhan's topographical accuracy was examined by A. Stein who shows the genuine basis of Sanskrit names from which modern Kashmiri names have been derived. Phonetic changes may be seen but the Sanskrit root is discernible. Terms recurring constantly are *Pura* (*por*), *Gram* (*gama*), *Kundla* (*kondal*), *Naga* (*nag*), *Mathika* (*marg*), *Kulya* (*kul*), *Vata* (*vor*), *Saras* (*sar*), *etc*.

There is considerable Buddhistic influence in some names, particularly towards Ladakh.

COMMON FEATURES

The valley of Kashmir has had two physical divisions, *Maraj* and *Kamaraj*. Each division has its characteristics and people are even known by the water they drink. The rural population has its social status dependent on economic stability and a non-agriculturist is less esteemed in society. Ownership of livestock is the wealth of the working farmer and animals form the working capital. Cultivation of maize, in particular towards higher elevations of the Karewas and above 6,000 foot contour, altered the landuse pattern.

Residential villages extended towards higher altitudes so that service to the cultivator became available from the domestic base and gave rise to quasi-townships with facilities and services provided to the more populated areas. As the towns grew all services were not available within the circumference of the town itself. Tourist interest apart, it is now the economic base which forms the nucleus for future urban expansion. Crowded jumbling of residential houses with narrow lanes as in Sopore, Baramulla, Anantnag (Kashmir Province), Jammu, Udhampur, Kathua, Rajauri and Punch (Jammu Province) stick to the core unlike new urban settlements. New functional areas have come up within new urban centres.

The distressing factors of the urban growth in the State is the glaring imbalance between the two cities of Srinagar and Jammu and the smaller towns numbering 17 and 20 in class V (population of 5,000-9,999) and class VI (with less than 5,000 population) respectively. The classification reveals that only 13 towns have had any visible change in their demographic trends since the State, as an integral part of India, came under the Five Year Plans.

The remote areas termed backward like Kishtwar, Gurez, Gool-Gulabgarh, Punch and Rajauri received special attention for development. The overall economic and social development promoted the cause of socialism treating everyone alike irrespective of caste, creed and religion. What is more, opening of roads and speedy means of transport increased mobility with the result that socio-economic activities received prominence.

Social stagnation has come to an end. The people have awakened to a faith in the secular approach to problems of life. The regional development and regional imbalance is recognized as a challenge to be met with courage and assistance from the government with its schemes of planned development. At the village level too, an economic base is visible now and development is no more an isolated phenomena but a related process of growth, expansion and interdependence.

An outstanding feature of rural life in the Outer Plain and the Outer Hill Region is the presence of forts scattered on elevations. This Rajput feudal feature of physical and might formed the symbol of awe and authority for the inhabitants who are mostly engaged in agricultural pursuits. Identifying their origin in the royal dynasty military service gave a sense of pride to this class of landed gentry. Economic backwardness became an accepted feature of life and the entire energy and time was devoted to religion, worship and aimless labour as in backward areas of Ladakh, Punch, Kishtwar, Rajauri and the valley of Kashmir to its north and north-west. Mountain routes and bridle-paths kept the slender thread of life in motion that too when pilgrims, tourists and men with authority moved from place to place.

Festivals kept the sprit of people alive. These had no doubt a religious base. In remote areas of the State, these festivals depicted life in its various aspects. In Ladakh with its bleak and dry environment the lama priests presented imaginary creation with life, death, suffering and salvation. Good and evil figured prominently in dance and drama. A regular calender of festivals began from the beginning of the new year at *Mela Losar*, *Mela Chimmerrey Gompa*, *Mela Sheh Shuba* and the celebrated *Mela Hemis Gompa*. Within a radius of about 30 miles from Leh, the only urban settlement in Ladakh, these festivals 'flavoured' life with mobility, music, dance, worship and contacts. In bitter cold festivals are held and *chhang*, a local liquor used to warm up the body for dance and drama. Spring and autumn have their respective festivals where processions are taken out and masked dances showing the defeat of the devil. Effigies are burnt, prayers offered and monastries sanctified with some mysterious practices known to the lama priests. Superstition dominates the mental canvas, magic and charm forming the spirit and substance of the festival.

In the Outer Hill region of Jammu there are temples and shrines. Festivals formed an important part of life when the Rajput chief and landlords financed the celebration. People from surrounding hills assembled to offer prayers and benefit from the festival market display. With the opening of roads some minor festivals merged into bigger festivals, providing a market place for some days.

The early settlers in Kashmir devoted their entire winter to festivals of which some are honoured even now. The *tantric* festivals clearly show how by meditation and deep philosophic thinking festivals presented a picture of advancement in culture. The effect of environment in this mode of worship and religious practices culminated when Mahayana Buddhism was adopted by the Brahmins, making Gautama an *avtar* (Prophet). Various schools of the Hindu philosophy influenced the mind of the Kashmiris who enriched their store of philosophic knowledge with everything good and beautiful that made an appeal to their mind.

Severe winter stimulated philosophic thinking and the search for the self resulted in an indigenous school of philosophy known as Shaivism—the doctrine of Recognition of self.

It is not within the scope of this study to describe exhaustively how geographical factors have influenced ancient thought and mode of worship in the territories of Jammu and Kashmir. But for any such study, regionalism is to be considered for various purposes, particularly isolation and difficult means of communications which hampered contacts between one zone and the other. From early times the valley of Kashmir, however, identified itself with the supreme might and bliss called *Shakti*, as known in the tantric texts. The physical background of the valley; its agricultural economy believed to have originally been founded by the female, gave her superiority and by no means a lesser position to the male in its rituals. From early times storing, protecting and domestic planning for comfort has been the task of woman whose responsiblity to the gods and even the dead was, indeed, marked. It is not difficult to see how meat, fish, fried grains, wine in the form of *Panak* conform to the *Panchmakara* of the ancient *tantric* rituals. The use of meat and fish appears to be a religions custom.

Bandopadhyaya, one of the most, eminent of our scholars on *tantrism*, observed that according to some of the competent archaeologists *tantrism* entered India through Kashmir when a branch of the dark-skinned Aryans migrated from Iran (Persia) towards Kabul crossing Takla Makan. A branch of them moved across Gandhara, modern Peshawar, and reached Maharashtra while another crossed over to the hilly traces and spread as far as Bengal. Concrete material relics of *tantrism* are traceable among the Indian ruins. The culture of the Hindus in Kashmir, therefore, bears a deep mark of *tantrik* influence.

In Kashmir the Buddhist influence has dominated *Tantras*, particularly the Mahayana Buddhism. Tantric thought was scientific, far ahead of Aristotle who said that the heart was the seat of consciousness, nay, it was brain in the head, science and magic. Instinctive materialism became a spiritualistic penance of *Bhakti*, *Puja*, *Moksha*. Being agriculturists from very early times the female principle (*Prakrit*) was accepted as the ultimate reality as represented by the *Tantric* and the *Sankhya* philosophy.

The spread of Budhism in Kashmir may have weakened the rigidity of rituals but as philosophy *Nirvana* could not shatter the strength of ideals explained by the *Upanishads*. In a harsh environment where it was difficuit to satisfy the increase in demand, the principle of *ahimsa* and mortification were forgotten and Buddhism ceased to be a code of vegetarian conduct.

The influence exerted by a harmonious landscape on the new faith of Islam, (which had lost much of its aggressive character till it reached the high hills of the Himalayas) brought about a fusion in the quest of truth where the mosque and the temple faded before the real quest of sufis and mystics seen in common places of worship at Hamdan, Hari Parbat, Tsrar and other holy places in Kashmir.

Mention may, however, be made of an indigenous system of philosophy of Kashmir known as the Doctrine of Recognition.

The monastic *Shaiva* philosophy originated and evolved in the valley of Kashmir. Its beautiful, charming and enchanting environment inspired thinkers to create and evolve a sufficiently interesting and attractive philosophy. The dryness of philosophy changed into sweetness in Kashmir. This land inspires love and affection in human hearts. So the philosophers of this land, unlike those in so many other parts of the world, discarded all painful and torturing methods of seeking God and advocated interesting and blissful methods of *Rajayoga* based on extreme love and devotion for the ultimate reality.

Life in Kashmir has been so easy and simple that the philosophers of this land also have worked out simple and easy paths to attain the final good of life. The soil in Kashmir has been yielding the necessities of life without much torture of human body and human mind and the philosophy of this country also does not advocate any torture of body or mind by painful penance or depressive practices of the control on breathing as advocated by the preceptors of many other schools of Indian philosophy. On the other hand, it recommends such paths of peaceful meditation as are free from repression and torture. Those are the paths of gradual sublimation of emotions and instincts through *Rajayoga*.

The natural beauty of Kashmir has been inspiring poetry even in philosophers and in the philosophy expressed by them through the medium of logic.

The Kashmir Shaivism, as it is, must have been the result of intuitive revelations brought about by an intensive meditation practicable by aspirants who must have been free from all physical and mental cares. These persons could have been some ancient Kashmiris who, having been ever protected from invaders by the mountain walls and having stored all the necessities of life in their homes lived secluded for long winter months. Such a conducive environment induced the deepest philosophic insight possessed by philosophers like Somananda, Utpaladeva and Abhinavagupta.

The Shaivites of Kashmir, unlike the Vedantins or the Buddhists, did not adopt or advocate the path of *Sanyasa* which necessitate some disciplined ways of life by constant wandering, begging and living with scanty clothing.

The Shaivites of the South, having been influenced by the rough, rugged and frightful environment of that country, developed into sects of mendicants like the *Kapalikas* and the *Lingayatas* but the *Shaivites* of Kashmir, have ever been living the lives of happy and contented householders and have been pursuing both worldly and spiritual aims of life side by side. The Shaivites of the South stopped at the stage of nature of diveresity, perhaps, because of the diverse types of nature of its different areas, but the Shaivites of Kashmir rose to the highest point of the absolute monistic unity, perhaps, on account of the unitary type of the nature of the whole valley and also on account of the influence of the extremely high altitudes of the mountain peaks surrounding it.

The immense beauty of Kashmir lies hidden inside the walls of hills, forests and mountains. The Shaiva philosophers of Kashmir have, therefore, advised aspirants not to make themselves known by means of red robes and also to keep the nectar of their spiritual attainments concealed under the cover of the worldly activities of a householder in the manner of a coconut fruit which keeps its nectar-like sweet juice and kernal hidden under its ugly covering and well protected inside its hard shell.

LANDSCAPE AND PHILOSOPHY

Ever changing seasons with almond blossoms in spring scenting the air, multicoloured flowers and the song of birds impart life and joy to the landscape in Kashmir. Thus is inspired vitality in flora and fauna towards maturity. As summer approaches with paddy fields and luscious vegetation green in grandeur heading towards the ripening of cereals and fruits to be followed by a golden autumn. Dryness stiffens the leaves which fall like petals till these are buried by a heavy snowfall in winter months. This study of the changing moods of Nature instils a feeling of renunciation not of the world but of worldliness. not of action but desires, this so aptly is observed by saintly poets of Kashmir.

ECONOMIC AND SOCIAL CIRCULATION

It is known that throughout history Kashmir, Jammu, Gilgit and Ladakh have had harmonious intercourse across its borders with the Chinese and Russian Turkistan on the north and Chinese Tibet on the east. The village, whatever its form, performed a social function and added its slender service and material to the mainstream of trade and travel. In the valley, however, concentration of economic self-sufficiency resulted in contentment and leisure providing sufficient scope for intellectual activity. It was natural that art and skill now seen in exquisite designs of art and craft should have attained excellence.

Geographical setting had its influence on human effort and social circulation. To a large extent division of labour and specialization could be seen in the province of Jammu at Samba (printing), Jammu (leather, Nara-making), Billawar (wooden implements), Bhadrwah (coarse woollen blankets), Kisthwar (coarse woollen cloth), Mirpur (needlework), Anantnag (wooden goods, *gabba*), Baramulla (woollen goods, building stones, processing of fish), Srinagar (woodwork, paper-maché, silverware, imitation jewellery, embroidery), Mattan (brass utensils), Leh (*namdas*, carpets, pashmina wool), and the like. The village has, therefore, been the unit of economic and social activity. Importance was, however, given to the villages close to the administrative centres where the surrounding area formed the field of service. The centres resumed urban character as is seen now in the growth of towns and glorified villages.

The cultutal landscape had an interesting feature of festival-*bazars*, annual fairs and pilgrim journeys representing a dynamic aspect of rural Kashmir. The pilgrimage to Swami Amarnath in summer, the pilgrimage to Harmukat Ganga, the ceremonies to the dead at Mattan and monthly prayers at Tulamula, Friday prayers at Tsar, Hazaratbal, the festivals at Ladakh, the pilgrimage to Vaishno Devi in Jammu are some of the instances to appreciate social life in its dynamic spirit. To this list may also be added the contribution of sturdy sikhs who, wherever they settled, a seat of worship became the centre of religious and social activity with a musical mode of worship attracting the Hindus as well.

Larger towns like Anantnag, Baramulla, Handwara, Sopore, Doda, Bhadrwah, Reasi, Punch, Rajauri, Leh, Gilgit strengthened their ribs of communications. Tourist centres added to this expanding activity of travel and trade imposing its influence on the rural settlement. Larger villages became "glorified" along with religious centres providing the area with goods and services. In the discussion on economic development it has been shown that rural resources are being deployed for planned development.

The rural landscape has changed in the territories forming the State of Jammu and Kashmir. The rate of progress has not been uniform but rural uplift is a common feature of economic life. Recent history has shown that by and large the resolve to usher in a secular and democratic way of life for cultural development appears a settled fact.

Chapter XVI

TRANSPORT, TRADE

Transport means movement of goods from one place to another. Transportation is the life-blood of commerce necessary for the development of internal as well as external trade. Transport is regarded as essential for that standard of individual consumption which is generally the hallmark of civilization itself. At present, speedy travel with comfort is regarded as an indispensable part of culture.

Geographical factors govern transport and means of communications. In view of the diverse relief features and varying climatic conditions in Jammu, Kashmir and Ladakh, it may not be possible to present an uniform account of the transportation system for the whole area of the State of Jammu and Kashmir. As a matter of fact, the growth of the transport system affords the principal clues to the stages of civilization as it enables commodities, persons and news "to master space".

Man is still the beast of burden in some mountainous areas of the State. Yaks and goats also help in carrying loads as in the district of Ladakh which has an area of 95,876.0 sq. km. with 11.3 sq. km. as urban. There are 238 villages in this district. As the altitude decreases ponies are used. It is only in rising plains and undulating slopes that carts without wheels—a type of sledge—are used. There are bridle-paths in these lofty mountains. The mountain paths are utilized for purposes of travel and movement of goods.

In a valley like Kashmir, the rivers are navigable and the roads are easily passable by wheeled traffic. These are regarded as stages in the development of transportation. Thus the territories of Jammu and Kashmir are still in all stages of development of transport from human agency (porters), by pack and drought animals like mules, donkeys, horses, bullocks and yaks, rivers, roads, railways and airways. Popular and economical transport, in a region depends on relief, climate and availability of man, beast, material and degree of skill. Such a study is necessary in the State of Jammu and Kashmir with its diverse features.

THE JHELUM VALLEY ROAD

The Jhelum Valley Road is regarded as an engineering feat. This road follows the river Jhelum from Srinagar, the capital of the province of Kashmir, to Baramulla where the river narrows down into a mountain gorge before it leaves the valley of Kashmir. Not navigable beyond this point, the road rises on to the winding spurs of the mountains through the Uri gorge, now a vital point of strategic importance on the Line of Actual Control. This road leads through Garhi till it reaches Domel near Muzaffarbad where the clean blue waters of the river Krishenganga join the river Jhelum. At Domel the road takes a bend to the west till it reaches Kohala where the bridge on the river marks the boundary of the State with Pakistan. The Jhelum Valley Road was maintained in a good condition and 211 kms distance from Srinagar to Kohala was the responsibility of the Kashmir Government. Annually on an average 8,000 motor cars and 3,000 motor lorries passed over this road from Srinagar to Rawalpindi across the Jhelum-Krishenganga at Kohala and over the Murree-hills.

After the invasion by Pakistan in the year 1947, this important road suffered and it became a military road beyond Uri. This road to Uri is an internal highway for the development of the Kashmir Valley and also the main means of communication and transport for the defence of India on this side of the border. This commercial artery in the valley of Kashmir with its efficient network of auxiliary roads to the east, west and south is of immense geographical importance.

THE BANIHAL CART ROAD

The Banihal Cart Road connects Srinagar with Jammu across the Pir Panjal Range through Banihal, Ramsu, Ramban and Batote, Kud and Udhampur.

The drainage of the Chenab in its upper course lies in these mountains, where Doda and Bhadrwah are situated to the east. The first tunnel at a height of 2,743 m above sea-level is no more in use now.

The boring of the Jawahar Tunnel at 2,200 m height in the Pir

Panjal has discarded the snow-bound loops of the Banihal Cart Road above 2,200 m contour. It keeps the road open mostly throughout winter. The Banihal Cart Road with all othcr connected roads was maintained in a .fair state of repair till the year 1947. In summer months the Banihal Pass 2,830 m above sea-level was kept open till November when snowfall would block the way for about five months. A light traffic consisting of 867 motorcars, 11,452 motor lorries and 30,000 other conveyances used the road from Srinagar to Jammu and vice verse till 1947.

THE GILGIT ROAD

Beyond Tragbal at a height of 2,743 m above sea-level starts the much-talked of Gilgit Road. This is recounted as another engineering feat of the world. Originally a military road of considerable importance, it covered a distance of 385 km in this strategic region. This highway made history in the early years of the present century. The road was completed in the year 1893 when it was only 3 m wide with a miximum incline of one in ten.

Beyond Gilgit through Hunza, Nagar and Misgarh man continued to be the beast of burden assisted by the yak to carry heavy loads. In these lofty mountains, movement is difficult when it is very cold. Craggy paths lead to the slopes of the Pamir Plateau through the Kilik Pass. The Union of the Soviet Socialist Republics of Central Asia lies beyond the Pamir and Kizil Rebat, its last air base across the frontier. To the north-west of Gilgit, the mountain-paths connect Yasin, Ishkuman, Gupis, Sher Qila and Dib.

As already mentioned, the district of Ladakh is surrounded by the lofty Karakorum mountains with the province of Sinkiang to the east of Tibet and the Leh Road from Sonamarg, Baltal across the Zoji La (3,505 m above sea level) through Machai, Dras, Kargil to Leh. Leh is the centre of commercial activity where formerly caravans from Sinkiang across the Yarkand river came with their merchandise to be bartered with goods from India. The tourist, the traveller and the trader thus kept the Aksai Chin Road alive with activity till the year 1947.

PLANNED DEVELOPMENT

The widening of roads, opening of new roads, metalling of roads, improvement of roads and construction of fair-weather roads was followed according to need and usefulness of an area as shown below :

1. Construction of the Kalakote and Jangalgali Roads for carrying coal to Reasi via Katra. Pilgrimage to Vaishno Devi and geological mineral surveys.
2. Construction and improvement of the Jammu-Akhnoor Road for traffic, timber and maintenance of the Ranbir Canal.
3. Construction of the fair-weather road from Nowshera to Rajauri for defence via the Chings Fort and communication to Punch via Bhimbergali.
4. Construction of the Uri-Hajipur Road nearer to Kashmir and the State of Punjab for traffic.
5. Construction of the Pahalgam-Chandanwari Road to attract tourists for sight-seeing and pilgrimage to the Swami Amarnath Cave.
6. Extension of the boulevard from Kral Sangri (Srinagar) to Nishat, Shalimar and Harwan.
7. Construction of bridges on the river Jhelum in the city of Srinagar at various places.

AKSAI CHIN ROAD

Even the remotest regions of the territories of Jammu and Kashmir like Baltistan and Lingzi Tang (Aksai Chin) had communications and transport facilities, as can be seen from any map drawn before the year 1947. From Dzong (4,285 m above sea-level) Longitude 80° East in the Kailas mountains, the common route passed through Tashigong, Damchok connected with Hanle and Koyil. The path of Rudok in the east took a turn due north from Tashigong to Char-kang and through Roskum to Rudok 4,541 m above sea-level now on the Aksai Chin Road. Chushul had two parallel paths meeting at Tangstse and then to the Shyok. The Shyok river is followed by a route-road from Shykpa Kuzang, Malk Shaj and Shahidullah Mazar into Sinkiang.

River transport from Khanabal to Baramulla was cheapest for heavy materials with reduced freights. Trade was brisk through Ladakh, Aksai Chin across the river Yarkand into Sinkiang and what is more the northern frontier was under constant vigil of the trader and the traveller till 1947.

LANDSLIDES[1]

Landslides are common in the entire territories of the State of Jammu and Kashmir. It is the the downward and outward movement of materials forming slopes that give way under rain water which serves as a lubricant. Gravity too has its effects in making the flow of rock material, soil and other materials possible.

The landslides pose a serious problem in the means of communications particularly in the Middle Himalayas between Banihal and Udhampur through which passes the National Highway connecting the foothill town of Jammu with Srinagar. The boring through the Jawahar Tunnel (2,194 m) reduced the danger of the landslides over the crest of the Pir Panjal upto 2,830 m where the old tunnel which remained blocked with ice for more than five months, being then the only regular route into the valley.

The spots of recurring landslides are the Nashri, the Batote and the Dharmnthal in this unstable zone. There is pervioun sandstone without vegetation, unconsolidated loose material deeply weathered and underground water causing hydrostatic pressure serving as a lubricant for the loose material which becomes heavy in weight and moves down. It is risky to experiment with explosives at the higher altitudes where recently blasting of rocks created fractures which when filled with water add to the volume of underground water. The dangerous practice should be given up and cement groutings used to seal some of the fractures. These landslides of a complex geomorphic nature expose raw structure and soil in these typical anticlines.

The "devil's stream" *Shaitan Nallah*, presents a fractured scalp of weathered peaks due to frost action and strong winds striking the south of the Pir Panjal. The Murree clay formations and fissile slates are unstable with a steep slope towards the river Chenab. The vibration caused by the heavy traffic has in recent years added to the weakness of this zone where the road remains blocked often.

The "Nashri" landslide presents a cross-section at the 135 km from Jammu where the road has submerged down in the river Chenab at various places. A view of the lithology with the unconsolidated shales, sandstones in these landslides and clay is seen well. Spheroidal weathering is common in this mountain terrain like all the Murree formations of lower Miocine age. In Ramban, a typical type of landslide known *Kalipassi* (black landslide) is a common feature in the rainy season. Vertical channels caused immediate danger and the sealing of these channels with cement groutings was advocated to ensure a steady percolation of water in this highly fractured area.

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[1] Didwal R.S., *Science and Culture*, 1967.

Making of terraces at about 4 to 5 metres height, according to the gradient and supported by a retaining wall is bound to lay stable foundation for a road in curves. This will avoid considerable pressure on road which is "moaning" under the heavy vehicular traffic.

Beyond to the north where the river Chenab is crossed at Ramban the highly fractured fissible slates appear with their capacity to absorb abundant underground water when there is heavy rainfall. The buoyancy thus caused with the effect of gravity causes the unstable mass to move down and block the road. The rock structure at Makarkot is, however, different with Gnissces granite in a highly sheered zone. The fast flowing stream, 178 km long, from Pugal Paristan also requires cement grouting to check the fast flowing water which causes vertical erosion.

AIRWAYS

The two airfields, one at Satwari (Jammu Cantonment) and the other at Damodar Karewa (Srinagar), were used by Maharaja Hari Singh of the State for the landing of his aeroplane. These two airstrips proved of vital strategic importance in 1947.

RAILWAYS

The Jammu-Sialkot Railway, a branch of the North-Western Railway, served the State through the foothill town of Jammu (Tawi) and in winter months when the Pir Panjal was covered with snow, the entire traffic of Kashmir was directed to Rawalpindi through the Baramulla-Kohala-Murree Road. The railway line through Lala Musa, Sialkot and Wazirabad now in Pakistan was connected to Jammu. This railway link was cut off in the year 1947 as a result of the Pakistan invasion.

The Jammu-Pathankot Road (108 km) through Samba-Kathua-Madhopur across the river Ravi to the Pathankot railway terminus became the only highway. It was the main commercial route and also a strategic line for this border State till the railway was extended to Jammu.

PLAN-TRANSPORT AND COMMUNICATIONS

In India rapid development of the economy during the First Five Year Plan and the Second Five Year Plan burdened the railways for handling freight and passenger traffic. In the State of Jammu and Kashmir, however, the relief features and severe climate in winter months stood in the way of extending railway lines. It was only during the Third Five Year Plan that the Pathankot Railway line was extended into the district of Kathua over a newly-built railway bridge on the river Ravi connected with Udhampur through Jammu. Road development, therefore, received much attention in the absence of railways till the year 1972.

OUTER PLAIN ROADS

The crucial importance of transport and the Outer Plain communications in economic and strategic planning need hardly be emphasized. A sizeable proportion of the total outlay was devoted to the opening of new roads to the east and west of the Jammu-Pathankot Road, which is the only communication link of the State with the rest of of the country.

During the Plan period a network of roads has been spread in the district of Jammu; almost every town today stands linked with the National Highway. The Ghaumanasan-Gajansu area, which is the rice-bowl of the Jammu *tahsil*, used to be cut off from Jammu during the rainy season. It is now connected by a network of roads over which there is heavy traffic throughout the year. The level of the *kuccha* roads linking Jammu with this area was lower than of the paddy fields. The only place where water could easily collect was the road, which would become so muddy that no traffic on it was possible. Two all-weather roads now link this area with Jammu. The 10.4 km long Jammu-Ghaumansan Road and the 12 km long road linking Jammu with Gajansu are now complete. This also includes a 27.12 m span bridge over the Marh *mulla*. Through the construction of a 15.2 km road from Gajansu to Dummimolpore on the Jammu-Akhnoor Road via Kahnachak, an important village on the border, many villages have been inter-linked. The Jammu-Ambgarosa Road runs almost parallel to the Jammu-Dumana-Akhnoor Road towards the east through the countryside, meeting the Jammu-Akhnoor Road at the Karan Bridge over the Chenab. Ranbirsinghpura *tahsil* which is famous for good quality rice has eight link roads now with Jammu.

There is an 8-km long road linking Chak Mohammad Yar with Chakrohi. Another 8 km long road connects Deblehar with Arnia. An 8 km long road links Miransahib with Maralia Deoli with Pandoria and another 8 km long road connects Maralia with Deblehar. A 12.8 km long road links Bishnah with Arnia via Salchar. Ranbirsinghpura is linked with Deblehar by means of a 5.6 km long road and Miranshib with Bishnah by a 4 km long road.

To reduce presure of traffiic on the National Highway between Satwari and the Tawi bridge a 2.2 km long road passing through Gandhinagar has been constructed recently. This road is now being used for all outgoing heavy traffic.

Bari Brahamnan on the National Highway has now become a junction of three important roads. One road, 6.04 km long, links it with Bishnah. Another 20.2 km long road links it with Purmandal, the Kashi of Jammu. The third road, which is 27.2 km long, passes through Gurah Salathian and meets the National Highway at Bajpur. A 10.4 km long road from Laswara in the Rabirsinghpura area to Suchetgarh, an important check-post on the border, has been improved and developed.

In the Outer Hills is the city of Jammu where roads have opened up into the interior. The city has a regular bus service, passing through its roads, which links the Rehari-Silk Factory Road, the Shalimar Silk Factory Road, the New Colony Rehari Link Road, the Purani Mandi-Bhabra Bazar Link Road, the Canal Road, the Karan Nagar Link Road, the Rehar Talab-Tiloo Road and the Gandhinagar Road. This serves the ever-increasing urban demand for communications in this city. Through this network of roads passes the entire freight and passenger traffic to and from Kashmir.

In the Middle Himalayas the Banihal Cart Road has been widened by blasting the rocks on the sides of the road. The roads to Ramnagar, Sudhmahadev and Sanasar have been widened and metalled. The roads leading to Kalakot, Sair and Jungalgali are being developed to serve the mining areas. The roads to Doda and Bhadarwah are maintained properly.

The opening of the Jawahar Tunnel with its western and eastern tubes at 2,200 m contour in the Pir Panjal is a landmark in the history of transport and communications in the State of Jammu and Kashmir. The Banihal Cart Road is now open almost throughout the year because of this low-level tunnel.

The Pathankot-Jammu-Srinagar Road is the main outlet for the State of Jammu and Kashmir into other parts of the country. The transport, both public and private, is provided at prescribed rates of freight and fares fixed by the Government.

In the valley of Kashmir, a network of roads has spread all over connecting the main Highway. These roads have helped rural development and the assistance rendered by the National Extension Department has been of great importance. The road classification followed is according to the Nagpur Plan. Before the advent of the Five Year Plan, there were 2 km of road for every 259 sq. km and only 1.6 km of road on an average for a population of 2,000 persons in the State. The classification of the roads in the year 1958 was as under:

Types of Roads (1975-'76)

Category	*Length in km*
Black-topped	2,161
Metalled	1,902
Shingled	1,074
Fair weather	1,961
Jeepable	414
Total	7,512

Transport (1975-'76)

Transport yards	: 16
Bus Stands	: 16
Routes Operating	: 151
Routes K/m	: 8,072
Average seat capacity	: 42
Passengers carried	: 156 lakh
Goods carried	: 36.48 lakh Qtl.
Persons Employed	: 4,826

THE THIRD PLAN

During the Third Five Year Plan (1964-1969) there was considerable development in transport. Inter-State services to Delhi, Jullundur, Amritsar and Chandigarh proved of great relief to the people in general and traders in particular. A Srinagar to Delhi service direct has been of immense advantage. The revenue receipts recorded an increase from Rs 410,276 in 1949 to Rs 6,331,816 in 1966. The following table shows the steady growth in transport.

Year	*No. of buses owned by Government*	*No. of routes*	*Distance of routes in km.*	*No. of passengers travelled*
1950-51	8	2	756.8	1,200
1966-67	272	86	5,632.0	9,635,168
1975-76	544			15,600,000

In the private sector, too, many companies with their fleets of vehicles were set afloat with 2,441 privately owned load carriers and 758 passenger buses.

Many bridges were constructed during this period of which the following are important:

Location	*Name of Road*	*Span in km.*
Singpora over the flow channel	Srinagar-Baramulla	736
Narhal Tangmarg	Srinagar-Gulmar	720
Sumbal	Shalteng-Bandipur	880
Baradari-Resai Chenab	Udhampur District	736
Nartopa	Punch	307

THE FOURTH PLAN

The Fourth Five Year Plan registers considerable progress in the opening of the roads and their maintenance. About 223 villages with a population of 1,000 and above remained without any road connection. At present in India an average length of road per 100 sq. Kms is 10 km. In the State of Jammu and Kashmir the average ratio is 4.6 kms per 100 sq. kms. Being very low it is not to be forgotten that in the State where geographical conditions are not favourable for opening roads this rate of development is encouraging. The development of routes and magnitude of traffic is given below :

Year	Passengers carried
1966	9,440,067
1967	11,478,845
1968	10,238,355
1970	131.60 lakhs
1971	133 lakhs

A sum of Rs 3.50 crores was earmarked for expansion of regular transport facilities. A road survey was completed in rural area on village level and its building was to be taken up by stages. The target of 6,645 with 2,903 km surfaced and 963 kms unsurfaced in Kashmir and 1,906 kms surfaced and 993 kms unsurfaced in Jammu was achieved making a total of 6,765 kms.

The National Highway (Pathankot-Jammu and Jammu-Srinagar) was nationalized for the first time in 1966-67. Besides the Government Transport Undertaking implemented nationalization of passenger service on the National Highway, expanded the goods fleet, expanded long-rout service in cities and districts, constructed and established central and regional workshops, depots and amenities to the travelling public. Return tickets for travel with 25 percent concession to the employees, 50 percent concession to students and monthly pass tickets, 25 percent concession to the blind for travelling tickets became an attraction for people to come to the State.

JAMMU RAILWAY

The most important achievement in transport has been the extension of the railway from Kathua to Jammu—a distance of 96 km across the Ravi over which there is a regular train service now. There are direct trains connecting Jammu with Madras, Bombay, Calcutta and Delhi. Some of the important trains are the Sealdah (Culcutta), Srinagar Express (New Delhi), Kashmir Mail (Old Delhi). The railway stations from Jammu to Pathankot are Jammu, Bari Brahmanan, Vijaypur, Samba, Dyalchak, Hiranagar, Budhi, Kathua and Pathankot.

THE FIFTH PLAN

During the fifth Five Year Plan the on-going schemes are getting completed and a basic minimum need programme in rural roads has been attempted. The first priority has been given to spill-over schemes from the Fourth Plan. Special consideration has been given to the backward area. A feature of the road development scheme based on population in districts and villages is a scientific and social approach to the problem.

The airways have revolutionized travel in the State with airborne mail service and regular passenger-cum-goods flights from:

Places	*Time*	*Distance by air(km)*
1. Delhi to Srinagar	1½ hours	642
2. Delhi to Jammu	1 hour	527
3. Jammu to Srinagar	40 minutes	175
4. Srinagar to Leh	1½ hours	312

The post, telegraph, telephone, microwave, and television facilities alongwith the use of radio have helped traffiic in trade and the tourist industry, besides the unification of several units of the territories forming the State of Jammu and Kashmir.

Water transport continues to be utilized in the valley of Kashmir from Khanabal to Baramulla. The kinds of boats are the *Shikara doonga* (houseboat), *Khoch* and *bahach*. There are about 800 houseboats and 12,000 *shikaras* and the population of boatmen is 3000 (1971). These boats stay at the river banks and carry loads in the following waterways :

1. Shadipur to Tulamula-Sind Nala during the river Jhelum.
2. Katakul, Tsuntkul, Dal lake joining the river Jhelum.
3. Inland waterways.

TRADE

Trade is the backbone of economy in the State of Jammu and Kashmir. Statistics are unfortunately not available regarding the regional flow of men and goods it is not possible to analyse data for any definite conclusion. The paucity of such data hampers proper economic planning to a considerable degree. An observable but misleading fact is that the picture of the resource base in the State of Jammu and Kashmir is not clear and to determine any definite level of economic progress is difficult. Internal flow of goods, inter-regional movement of men and material figures are not available for examining the imbalance between the developed and undeveloped areas of the State.

During the Fifth Five Year Plan an allocation of Rs 1,800 lakhs for Ladakh and Rs. 1,078 for *gujjars* and *bakerwals* has been made. The backward areas will "claim" Rs 2,000 lakhs but little is known about the justification and the scope of development envisaged. The value of goods moving along the National Highway forms the main part of mobility in trade. Preparation of statistical data for exports and imports may be a right indicator for determining trends in trade and commerce. When the economy is changing fast, up-to-date statistics need constant revision and analysis. For the year 1973-'74 the picture of exports and imports in given below:

Export Trade, 1973-'74

Goods	*Quintals*	*Goods*	*Quintals*
		Silk (raw and cloth)	2,200
Timber	750,038	Pulses	17,202
Fruits	735,975	Fibre	13,414
Minerals	31,515	Woolen Cloth & Knitwear	9,200
Hides and Skins	23,753	Herbs and Medicines	14,600
Bones	3,880	Honey	1,000
Anardana	3,047	Guns	1,000
Rubber goods	2,900	Rosin and Turpentine	1,261
Oilseeds	2,567	Fir goods, paints, varnishes, tea, saffron, *guchhian*	4,000
Wine	1,665		

Regarding the imports the statement of goods is given below:

Import Trade in 1973-'74

Goods	*Quintals*	*Goods*	*Quintals*
Grains and Pulses	1,534,858	Soaps	42,012
Brass and Copperwares	635,783	Paper and Stationery	38,718
Coal	555,179	Paints, varnishes	27,755
Iron goods	402,322	Leather, leather goods	25,580
Sugar	389,629	Electric goods	20,274
Oils	275,442	Glass, Glasswares	17,936
Salt	269,593	Oil seeds	17,298
Petrol, diesel	419,849 litres	Wine	13,845
		Rubber goods	12,629

Vegetables	164,483	Spices	10,347
Fruits (other than grown in Kashmir)	138,276	Motor parts	9,476
		Crockery	7,347
Cotton and cotton cloth	129,489	Hosiery	5,348
Asphalt	101,960	Sports goods, guns, ammunition, woollen and silk cloth, knitwear	129,668
Fodder	89,904		
Medicines	62,934		
Cigarettes, tobacco	51,806	Buses, trucks	1,090 nos.
Tea	47,065	Livestock	547,758 nos.

Except for woolen cloth, drugs, silk cloth, guns and turpentine there is a general trend of exports of raw materials from the State which is not a sound picture of trade. Imports consist of foodgrains, salt, oil and sugar. Petrol and diesel come next followed by cloth. Food and clothinq form the main imports together with goods required for every day use.

According to the budget (1973-'74) the main heads of revenue for the State of Jammu and Kashmir are:

Revenue Receipts (*1973-'74*)

(*In Rupees*)

Industries	12.75 lakh
Excise	44 crore
Electricity	4.29 crore
Sale stamps	62.00 lakh
Road Tax	5.10 crore
Liquor	5.9 crore
License fee	6.16 crore
Sales Tax	166.59 lakh (75-76)
Road toll for passengers	
Central Aid	55.77 crore

The value of the net output originating in the State in 1960-61 was about Rs 83 crores with 77 percent of agro-income. The manufactures made up hardly 8.6 percent and the trade sector 4.7 percent which is not in proportion to any of the investments made so far.

Chapter XVII

TOURISM

HISTORY

In Kashmir tourism has an old tradition. During the Medieval ages transit traffic from Central Asia to this mountianous area of the Himalayas passed through high altitude and the inhabitants had to provide travellers and merchants wih accommodation, supplementary horses for the steep passages, travelling conveniences, security and repairing for the transport material used. Meagre construction and keeping up the roads in some order gave work to many people. Today we are reminded of these old rest houses called *Serais* and castles though now in ruins.

THE BEGINNING

It was in the year A.D. 1823 that a sort of regular mail line between the State of Jammu and Kashmir and Lahore was started in the pre-Augustinian sense. It only served the purpose of administration between the sovereign authority at Lahore and the capital of *Suba* Kashmir. This was man-mail transport carried out by *Harakars* the *dak*-carriers. There were as many as 38 stages between Srinagar and Lahore.

The imperial post-office was set up for the first time in Kashmir in 1867. It was primarily for the convenience of the British residents who came to Kashmir in summer.

There has never been a time in history when Kashmir remained completely aloof. Writes Pandit Jawaharlal Nehru : "Kashmir had been a meeting ground of different cultures of Asia, the western Greco-Roman and Iranian and the Eastern Mongolian, but essentially it was a part of India and the inheritor of Indo-Aryan traditions."

In spite of the hard blows of history, "Kashmir is a country which delighted in insurrection." Thus it preserved a harmonious mingling of different cultures presenting the spirit of India purged from the dross of creeds.

Boat procession in the river Jhelum

Gulmarg in winter

Long before 326 B. C. when the King of Kashmir deputed his brother to announce his submission to Alexander, there was a fair mobility of passengers and goods in this mountainous area. It was in the time of Ashoka that the Brahmins of Kashmir originally *shaivites*, began to admire Gautama. In the reign of Kanishka monks and scholars came to Kashmir from distant lands signifying that through centuries travel was peaceful. The philosophic thought of the Buddhists brought many monks through mountain routes to the land of Nagarjuna at Harwan near Dal lake. It continued till the eighth century when Shankaracharya came to propagate Hinduism that Nagarjunakonds languished.

There was a regular route from Hashkapura (Hazara) wherefrom the famous Chinese pilgrim Huien Tsang came to Kashmir in A. D. 631-633.

The limestone ridges west and north of Khonmuh and Khrew present a splendid series of strata being of special interest to geologists as these contain important fossils.

There is the most interesting little temple of Payech nearer from Padgampur on the river side from Avantipur to Malangpur across the Karewa to Payech. The entire landscape of the western mountain is a fascinating grandeur. Then above Avantipur opens the valley of Tral leading to the lidar valley.

Anantnag is the second important town in Kashmir. It is built round the foot of a conical hill with beach marks showing the level of the lake. It is picturesquely embedded in trees and intersected by running streams. There are many springs. From here a visit to Verinag, Achhabal, Martand and the Lidar valley is easily possible. Besides routes to southwest leading to :

Kulgam, Sandmarg, Manzgam, Aharbal Falls, Kongwattan, Konsar Nag and Shopyan.

From Verinag to Kokarnag (11 kms) the route to Kishtwar via Sinthal Pass is easier.

Martand with its massive and noble ruins is at the corner of the 'dar valley.

The Pir Panjal mountain range from Banihal to Baramulla is a fascinating ground for trekking. There are camping sites near small and big turns and undulating Alpine valleys with small glaciers. This mountainous area abounds in lakes.

From	*To*	*Distance in kms*	*Description*
Srinagar	Pampore	16	Saffron flowers bloom in October
	Avantipura	19	Ancient ruins of temples.
	Anantnag	54	Popular town. *Gabba* making.
	Mattan	60	Famous Vishnu-Surya temple holy pilgrimage
	Pahalgam	96	Hotels, Restaurants. Base Camp for Sri Amar Nath Pilgrimage
	Tru	109	Atmeadow. beautiful
	Chandanwati	111	Enchanting wild scenery
	Achhabal	64	A moghul garden with three aquaducts. Pavilion in centre with waterfalls.
	Kokarnag	79	Water helps digestion
	Verinag	80	Source of the Vitasta (Jhelum)
	Gulmarg	51	Natural golf courses. Hotels. Skiing in winter
	Khilanmarg	55	Snow covered streams
	Wular Lake	125 sq. km area	Fresh water. Fish.
	Dodarhama	19	Cool shade of the Chinars Ice cold water
	Sonamarg	80	Gorges. meadows. On the trade route to Ladakh
	Thajwas	81	Glaciers spread over
	Baltal	95	Sindh stream with risky icy bridges
	Usmarg	40	Paritherum cool water
	Chrari Sharif	30	"Ziarat" of the famous patron saint of Kashmir Nund Rishi

Tourists coming to Kashmir are at an increase as shown below :

Year	*No. of visitors (Non-Indian)*	*Indian*	*Total*
1971	15,733	105,420	121,153
1972	17,041	108,445	125,486
1976	38,078	286,412	324,490

In Jammu Province at Vaishno Devi the number of visiting pilgrims is above 7 lakhs (1976).

Chapter XVIII

THE REGIONS

In this region of mountain and valley complexes where sharp physio-cultural distinctions within short distances are quite well-marked, there exist certain broad distinguishing elements which render possible the major regional divisions.

Climate in association with the location of the region clearly distinguishes two first order divisions, i.e., (1) the Kashmir Region South and (2) the Kashmir Regioh North.

The Kashmir Region South is rather conterminus with the windward Kashmir and is characterized by relatively lower altitude under the shadow of the Himadri and the existence of some broad basins; its opening into the Great Plains has fostered, from time immemorial, the concentration of almost all the human activities in the region. On the other hand the tangled high altitude mass of the Himalaya with alternating inaccessible snow-clad high ranges, deep valleys with precipitous scarps along with the vast, often snow-covered platform forming a rain shadow zone, presents an inhospitable environment for any but a few human activities. This mostly Trans-Himalayan region has now become of great strategic significance as well. The two first order divisions have been further distinguished into as many as 6 second order and 24 third order regions as follows:

REGIONAL SCHEME

Kashmir Region

1. Kashmir Region-South

(*a*) *Kashmir Valley*
    (*i*) The Jhelum Plain
    (*ii*) The *Karewas* (Terraces)
    (*iii*) The Rimlands

- (*b*) *Jammu-Mirpur Region*
  - (*i*) The Foothill Plains
  - (*ii*) The Siwalik Region
  - (*iii*) The Lesser Himalaya or Pir Panjal Region

2. Kashmir Region-North

- (*c*) *Zanskar-Ladakh Region*
  - (*i*) The Great Himalayan-Zanskar Region
  - (*ii*) The Sindhu Furrow
  - (*iii*) The Ladakh Range
  - (*iv*) The Upper Shyok Valley

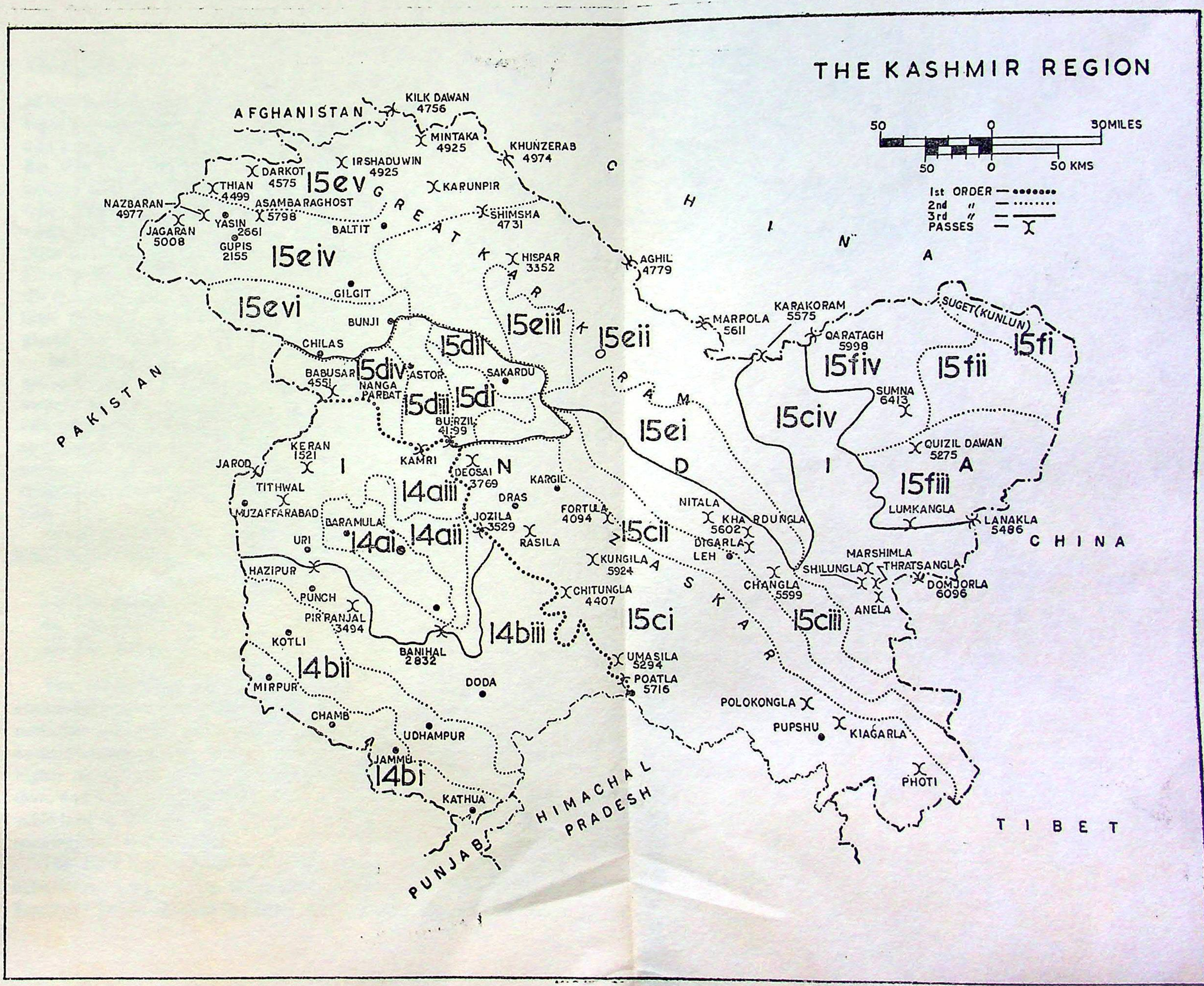
- (*d*) *Deosai-Skardu Region*
  - (*i*) The Deosai Highland
  - (*ii*) The Deosai Plain or Skardu Region
  - (*iii*) The Astor Valley
  - (*iv*) The Naga Parbat

- (*e*) *Gilgit-Baltistan Region*
  - (*i*) The Lower Shyok Valley
  - (*ii*) The Karakoram Range
  - (*iii*) The Shigar Valleys
  - (*iv*) The Gilgit-Hunza Valleys
  - (*v*) The Hindukush Region
  - (*iv*) The Gilgit Massif-Sindhu Gorge Region

- (*f*) *Aksai Chin Region*
  - (*i*) The Suget Range (Kun Lun)
  - (*ii*) The Soda Plain
  - (*iii*) The Ladakh Plateau
  - (*iv*) The Kara Kash Valley

The Kashmir Region South comprises (*a*) the Kashmir valley and (*b*) the Jammu-Mirpur region.

Set like a jewel in the tangled mass of the gigantic Himalayas, the vale of Kashmir attained a high degree of cultural development in contrast to its untamed rims. The alluvium-filled oval depression



Based upon Survey of India map with the permission of the Surveyor General of India.

Map 11

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of the Jhelum originally formed a structural "Dun" seated on the back of a vast "nappe" and was filled with a lake which was gradually drained out during the last interglacial epochs. The extent of the flat valley may be taken as the flood level of the Jhelum when the valley looks like the *Satisar*, the lake that it was before the Pleistocene times. The valley bottom is covered with recent alluvium varying in width from 5 to 30 km along the Jhelum. Though looking level, the plain has a fall northward of over 50 m in the first 55 km and only 18 m in the lower 40 km. The channel of the Jhelum flows close to the northern rim of the vale where the flights of spurs exhibit faulting, but these features are marked on the Pir Panjal side by the glacial fills. The valley is prone to floods very often.

Most of the region's agricultural, industrial and allied activities are confined to this valley. This zone of convergence and diffusion of various streams of thoughts, has ever since served as the political and cultural nerve centre of the region by and large through its hub at Srinagar. With all its indigenous arts and craftsmanship, it has unique position for saffron culture; rice and maize dominate the agricultural economy. The region has several places of tourist interest also.

Diversities too are numerous, both physical as well as cultural, which help in distinguishing as many as three subdivisions:

(1) The Jhelum Plain
(2) The Karewas, and
(3) The Rimlands

The Jhelum Plain extends from Khanabal to Baramulla and includes the flood plain and the *bahil* tracts. In the flood plain the river meanders sluggishly overflowing its banks when in flood. Spring and autumn are the seasons with heavy rainfall and melting snow from higher elevations increase the volume of water. Siltation is caused then, and what is more, fresh alluvium covers cultivated and cultivable land to the advantage of soil nutrients and causes swamps as seen beyond the Wular lake.

The *Bahil* region flanking the flood plain constitutes the main agricultural zone of the valley and contains the "Rice Bowl of Kashmir" in the Kulgam-Shopyan area. As the elevated tributary valleys open into the main valley from the west and the east the cultivation extends higher up in one from or the other.

(2) The Karewas are essentially the zone of uplands regarded by geomorphologists as the shelving shores of an inland sea and lacustrine in origin. The karewas form a distinct formation from the alluvial fill of the rest of the valley and are also contrastingly infertile. Irrigation is a problem on the karewa soil though notices in ancient texts appear about some sort of a wheel system of pulling up water as on the Damodar karewa, the site of the Srinagar aerodrome. However, irrigation facilities and pressure of population have pushed the frontiers of cultivation to these terraces. Maize is the dominant crop grown here and fruit cultivation (apple, plum and almonds) is extending fast in the region.

(3) The Rimland mountains around the valley rise above 3,500 m and are clothed with thick forests, mixed conifers in the north and on the Pir Panjal. In the winter snow covers the entire valley and the higher elevations remain covered up till the end of April. Logs are floated through the various streams into the valley. Higher slopes and meadows with grass and clean water are used by graziers. Several tourist resorts like Gulmarg, Pahalgam, etc. are of high importance.

Particular mention may be made here of the region which comprises part of Lower Himalayas, Jhelum gorge below Baramulla and the Krishenganga valley, with an average elevation between 1,500 to 4,000 m. Muzaffarabad is the main utban centre at the confluence of the Krishenganga with the Jhelum.

Local landscapic variations are significant enough to distinguish fourth order regions in the valley. Based on the agricultural landuse efficiency, the Jhelum Plain may further be divided into Eastern Verinag-Anantnag, Western Kulgam-Shopyan region, Khanabal, Sangam, Western Pulwama-Badgam, Sangam-Srinagar, Srinagar-Bandipur, Srinagar-Sopore, Bandipur-Sopore and Sopore-Baramulla regions. Similarly, the Kashmir karewas can be distinguished into the Martand karewas, the Kuthar-Sinthan East, the Eastern Lidar valley, the Northern Sind valley, the Lolab valley and Shopyan-Baramulla West. The rich forest-clad rims can be subdivided into the Merve-Wadwan, the Kolahai-Amarnath, the North Harmukh, the Western Baramulla, the Western Gulmarg, the Pir Panjal-Kutumarg West and the Jhelum Gorge-Krishenganga regions.

JAMMU-MIRPUR REGION

The region covering the Jammu Province occupies the southern flanks of the Himalaya comprising (*i*) the Foothill Plains, (*ii*) the Siwaliks, and (*iii*) the Lesser Himalaya (Pir-Panjal) varying in elevation from 3,000 to 4,500 m in general, just touching the snow-line along its eastern border. The region forms the second most important economic and cultural part of the Kashmir region. Its opening into the Sindhu-Ganga Plain distinguishes it from the sheltered valley of Kashmir. Also the region, except in the Pir Panjal, seldom experiences snowfall, so common in the valley. The recent political changes have added to its strategic significance for the country as a whole and the region in particular. The foothill plains comprise the wheat belt of the region and contains the larger proportion of towns such as Jammu, the seat of the Dogras, Kathua, Samba, Mirpur, etc.

The Siwaliks, as also in other Himalayan zones consists of forested and furrowed hills enclosing the structural depressions like Duns, notable being those of Udhampur and Kotli. It is in such depressions that rice cultivation has replaced wheat; elsewhere the Siwalik slopes with thin and eroded soil cover and limited means of irrigation are agriculturally poor. Maize, millets and barley are the main crops on the Siwaliks. With an abrupt ascent from the Siwaliks are met with the Pir Panjal (2,000-5000 m) with almost bare scarp faces and forest-clad tops prone to seasonal snowfall. Population is sparse and human activities are also limited mostly to pastoralism. It provides access to the valley only through its passes, especially the Banihal, now tunnelled.

Kashmir North is divided into four second order regions; (*c*) Zanskar-Ladakh region, (*d*) Deosai-Skardu region, (*e*) Gilgit-Baltistan region, and (*f*) Aksai Chin region.

ZANSKAR-LADAKH REGION

Zanskar-Ladakh Region constitutes the south-eastern part of the Kashmir region, comprising the almost uninterrupted stretch of the Himadri, the discontinuous stretch of the Zanskar encompassing within it the Zanskar and Dras valleys, the Sindhu Furrow upstream from Skardu, the Ladakh range, upper Shyok valley and Chang-Cheng-Pangong complex. It is characteried by snow-clad ranges rising to more than 6,000 m and high altitude valleys lying between 2,000-

4,5000 m. But for the *Himadri* the area experiences scanty rain. The human activities, whatsoever, are confined to the valleys only.

Ladakh is the land of Buddhist culture. People in Leh (3,500 m) are located on an extensive fan of over 8 km width in the Sindhu furrow, as the traditional regional centre. Naturally what Lhasa is to Tibet, Leh is to Ladakh. It is also of growing strategic importance being a regional route centre and its new route connection with Himachal will partly compensate the losses by the temporary disintegration of the trade routes from the central Asian nodes (Kashgar, etc.). Almost every village in Ladakh has its Gompa (monastery) built generally in a rather inaccessible high place.

Ladakhis may be divided into *Champas* or nomads who are pastoral in the upland valleys, too high for cultivating every patch of cultivable ground with good care in their traditional manner. They are mostly polyandrous; perhaps polyandry being a check on population responsible for the relative prosperity of the Ladakhis as compared to the general poverty of the Baltis.

THE HIMADRI-ZANSKAR REGION

The Himadri-Zanskar Region distinguishes itself by the higher altitude along-with relatively higher rainfall (50-100 cm) and thicker forest cover than its counterparts in Ladakh. It can be further subdivided as the Himadri, the Northern Zanskar, the Dras valley, the Zanskar valley and the Southern Zanskar region including the Rupshu Plain. Rupshu country in general is filled with great landlocked and brackish lakes. Rupshu lake covers an area of about 150-170 sq km and Tsomoriri is 24 km in length lying at an elevation of about 4,500 m.

KARGIL

Kargil is an important regional centre in the Dras valley being connected by an all-weather highway. The Shyok, with its tributaries, the Galwan and the Chang-Chenmo, is significant between the Karakoram and Chang-Chang mountains and is fed by glaciers. The rivers get lively in summer after the dull and frozen winter and with water the Shyok itself becomes "a clear rushing stream", about 10 m wide and is thus intermittent. The overall drainage pattern is peculiar here and the Chang-Chenmo seem to be a misfit. Its flood plain grows some vegetation like Tamarisk while the slopes are clothed with burtse;

higher up are the patches of grass which support the yaks and wild asses. Hot spring waters are used for agriculture on the gravelly plain. The upper Shyok (Chil Chap) includes the Depsang Plain which seems to be a high peneplain dissected as a result of uplift evidenced by various erosion levels.

THE SINDHU FURROW

The Sindhu Furrow is an almost straight and highly incised, but now regarded longitudinal valley between the Zanskar and the Ladakh ranges accounting for most of the human activities of the region. The valley is dominated by Hemis Gompa, the famous Buddhist monastery. Though the Indus furrow is barren, rocky and dry in general, it is dotted with fans built by the snow-fed tributaries; it is here that the fruit trees and arable lands with barley as the main crop are met with. About 35 km east of Leh fans disappear and swampy fields in contrast to the green fans are seen. Beardless barley (grim) is also grown on the slopes at about 4,500 m height. Wheat, pulses and root crops are grown only on the irrigated fans. The sheep yak are reared by the semi-nomadic people. *Dzo* (a cross breed of the cow and the yak bull) is an important draught animal as also the beast of burden.

THE LADAKH RANGE

The Ladakh Range (4,500-6,000 m) with almost regular crest and limited snowy peaks has gentlar northern slopes with rather pre-glacial mature relief as evidenced by rolling surfaces even at the height of over 5,000 m. The narrow valleys of 2 to 3 km width are found separated by low divides and the headwaters move sluggishly enough to form sandbars but downward after breaking through the morainic deposits their gradients become very steep (about 1 in 3) through their boulder choked-gorges. These river valleys show clear evidences of pre-glacial erosion levels, though affected by interglacial uplift. Though in general the region is very inhospitable for human occupance, grazing and pastoral activities are carried on favourable slopes.

THE DEOSAI-SKARDU REGION

The Deosai-Skardu region is subdivided into 4 third order regions (i) the Deosai Highlands, (ii) the Deosai Plain or Skardu Region, (iii) the Astor valley, and (iv) the Nanga Parbat.

The Deosai Highland with an average elevation between 4,500-6,000 m, rounded and flattened ridges and rather relatively broad valleys represents an erosion platform. The Skardu Region with an elevation from 2,000-4,000 m, shows evidences of rolling mature or late mature surfaces. The plains are generally dry and stony with some patches of grass, and frequent occurrences of swamps and bogs. The pastures are not used intensively and malarial climate also makes it unhabitable.

SKARDU

Skardu is the regional centre on the Indus near the confluence of the North Shigar, lying as it does on the traditional trade route through Muztag pass to Kashgar. The Astor Valley between the Deosai Highlands and the Nanga Parbat forms a transition. The region, though dry, grows several crops like wheat, barley, buck-wheat, maize and pulses alongwith lucern and other fodder crops through irrigation. *Astor* is the regional centre with post add telegraph office, rest house, inspection bungalow and dispensary. Downwards *Doian* is another centre with a rest house.

The Nanga Parbat mountain complex is separated from the main mass of the *Himadri* by the Kishenganga and Astor valleys, the Burzil pass lying inbetween. Towards the north is the Sindhu gorge. It differs from the *Himadri* in several ways. "Located at the structural interference of two major geanticlines, both of which had undergone repeated uplift in the quartenery, it has a gnanitoid gneissic core capped with sedimentary gneisses. In constrast to the NW-SE strike of the Kashmir Himalaya, it has a NS strike. To the exclusion of nappes, the late Tertiary and early Quarternery sandstones in the north are folded to form steep syncline along the Sindhu valley located in the crystalline zone". The massif with about 260 km of snow fields drains into small glaciers descending 2,440 m below the snow-line and exhibits erosional platforms at 3,960 m with rounded and flattened ridges and broad rudimentary valleys resembling the old morphology of the Deosai Highlands.

THE GILGIT-BALTISTAN REGION

The Gilgit-Baltistan lies between the west of Gilgit to the east of *Nubra (from Hindukush to Karakorum).* It is mostly snow-covered.

Baltistan gets about 15 cm rainfall and has more glaciers. Agriculture here has more favourable scope than Ladakh though dependent on snow-melts. Barley and naked barley are dominant crops and lucern is the main fodder. Peaches, melons, grapes, apricots etc. are the main fruits; some tobacco is also grown. However, social institutions keep the Baltis poorer than the Ladakhis. In Gilgit area settlements and agriculture are found on the watered valley tarraces. Gilgit has a stratgic and nodal location near the confluence of the Gilgit and the Hunza rivers. Rice, cotton, wheat, barley and fruits are the main crops. Hunza has better conditions and grows, apart from several crops, fruits and fodder on its terraced fields with kubl irrigation. The Lower Shyok valley with its triburary, the Nubra, suffers from severe floods caused by the backwaters of the Indus which lead to destruction of some riverine cultivated lands.

The usual crops of barley, wheat and fruit along with some fodder are grown. Fields are carefully fenced, terraced and irrigated. The Shigar valley has few isolated settlements with barley, buckwheat and fruit crops. The Indus gorge 20-25 km wide, and 4,572-5,182 m deep lies between the Nanga Parbat and Gilgit massif. It is a hot and arid strip looking like a desert embedded into icy gravels. It was rather depopulated by the great flood of A.D. 1841 caused by landslide blockade near the confluence of the Astor.

BUNZI

Bunzi is the regional service centre. Around it there are 3 to 5 lacustrine gravel terraces. The Hindukush is a high mountain complex, the heights ranging between 6,095-6,705 m with snow caps; only part of it lies in Kashmir. Only the tributary valleys have few scattered settlements. Waters also flow to the Wakhan, the valley of the Ab-i-Panja, a tributary of the Oxus. Thus the region can be subdivided into 6 third order regions; (i) the lower Shyok valley, (ii) the Karakoram Range, (iii) the Shigar valley, (iv) the Gilgit-Hunza valleys, (v) the Hindukush region, and (vi) the Gilgit Massif—Sindhu Gorge region.

THE AKSAI CHIN

The Aksai Chin is generally desolate and the driest part (about 6,000 m) of the Kashmir region. The area suddenly caught strategic importance when China annexed about 41,500 sq km. of this area through aggression in 1962. The region is divisible into 4 lower order regions based on varying terrain features: (i) The Kun Lun lying in the NE is snowcovered almost throughout. Below it lies (ii) the Soda Plain, (iii) the Central Plateau (Ladakh Plateau) studded with a number of glacial lakes often forming inland drainage basins, and part of it is almost permanently frozen, (iv) The Kara Kash valley occupies the western and NW part of the region and drains it northward beyond the region.

PROBLEMS AND PROSPECTS

The Kashmir region with the enormity of its size and paucity of human resources and strategic location in the Himalayan realm offers several challenging problems, geopolitical, social and economic. The early British contribution to the geopolitical issues of the region by promoting the buffer character of Tibet and Afghanistan (especially through the Wakhan) no longer holds in the context of the present political set up in Asia.

Under the prevailing geopolitical situation, attempts to forge ahead the process of economic and social integration with the rest of the country are foiled. The Government of India through its successive Five Year Plans and through granting special aids and concessions has tried to open up the region from its traditional aloofness and physical isolation. The development of the National Highway up to through the Jawahar Tunnel is a distinct achievement, and at least along it, new outlook and patterns are visible. Likewise, linking up Leh with Himachal and beyond with U.P. Himalaya with accompanying infrastructures will go a long way in integrating the Himalayan territories. What is needed then is linking up of Srinagar and Leh with Gilgit area which of course is bound up with political problems.

Even under the present circumstances economic uplift and integration of the hitherto inaccessible region with the rest of India will in its turn indirectly pulling the people of the outlying areas and may pave the way for political and social integration as is brewing up in the Aizerbaizan (shared by Iran and the Soviet Union). In this region too the tendency of frequent infiltration from the Muzaffarabad side is partly motivated by the lure of better life and prosperity in the valley of Kashmir.

The foregoing analysis of the regional personality reveals that the State's potential resources in the form of rich forests, green meadows and pastures, charming landscapes, abundant snow-fed water for power and irrigation, traditionally acquired skills for arts and crafts, production of quality fruits and nuts are reasonably adequate to build a sound economic base. The fertile soils of the valley, river terraces and other parts are capable of producing abundant food and raw materials not only to replenish the deficiencies but also to lead to industrial development. All this would generate forces of economic growth to the advantage of the region as well as the country.

The State is not able to raise the required capital resources and attract skilled manpower and other infrastructures from other regions. If the region is kept at par with the other regions of the country into settelement and resettlement of the pioneer areas, it will certainly go a long way in mitigating the forces of under development.

Chapter XIX

ADMINISTRATIVE DIVISIONS

It has already been stated that the State of Jammu and Kashmir suffered changes in its physical extent as a result of which reorganization of administrative units became necessary. With an advance in socio-economic development by the implementation of the five successive Five Year Plans, the rate of progress has been encouraging. Besides a considerable increase in population there have been many other factors responsible for the newly created administrative units.

Constituting an integral part of India, the State of Jammu and Kashmir has a population of 4,616,632 (males 2,458,315 and females 2,158,317) according to the Census of 1971.

(1) The growth rate from 1961 to 1971 has been recorded at +29.65.

(2) The number of districts was 9 in 1961. It has risen to 10 in 1971. The number of *tahsils* is 44 as shown below:

Jammu Province		*Kashmir Province*	
Districts	*Tahsils*	*Districts*	*Tahsils*
Jammu	1. Jammu	*Anantnag*	1. Anantnag
	2. Samba		2. Kulgam
	3. Ranbirsinghpur		3. Pulwama
	4. Akhnoor		4. Pahalgam
			5. Shopyan
			6. Tral
Kathua	1. Kathua	*Srinagar*	1. Srinagar
	2. Hiranagar		2. Badgam
	3. Basoli		
	4. Billawar		

Administrative Divisions

Jammu Province		*Kashmir Province*	
District	*Tahsils*	*District*	*Tahsils*
Udhampur	1. Udhampur		3. Ganderbal
	2. Ramnagar		4. Beerwah
	3. Reasi		5. Chadura
	4. Gool Gulabgarh	*Baramulla*	1. Baramulla
Rajauri	1. Rajouri		2. Sopore
	2. Nowshehra		3. Handwara
	3. Budhal		4. Sonawari
			5. Karnah
Punch	1. Punch		6. Uri
	2. Mendhar		7. Gulmarg
	3. Haveli		6. Bandipore
Doda	1. Doda		9. Pattan
	2. Kishtwar		10. Kupwara
	3. Bhadarwah	*Ladakh*	1. Ladakh
	4. Ramban		2. Kargil
			3. Zanskar

Agro-economic description of the districts is given as under:

ANANTNAG

The District of Anantnag has an area of 5,382.0 sq. km. It is the southern district of the Kashmir province with 5,325.4 sq. km. area as rural and only 56.6 sq. km. as urban. Situated in the north of the Pir Panjal mountain and watered by the Lidar, Rambiara and Vishav; the district is termed the rice-bowl of Kashmir. There are 6 *tahsils* in this district. The population of Anantnag district is 832,280 (males 450,353, females 311,927). The growth rate from 1961 to 1971 has been + 28.22, The distribution of population is given on next page.

The density of population per sq. km. is 155. The Muslims number 789,224, Hindus 33,753, Sikhs 8,910, Budhists 263, Christians 119 and Jains 3. The number of villages in this district is 1170. There are 6 urban centres classified as towns in this district. These are Anantnag (27,643), Kulgam (6,369), Mattan (4,771), Pahalgam (2,335), Kukernag (1,723) and Tral (6,465).

Distribution of Population

Tahsil	*Population*	*Number of residential occupied houses*
1. Pahalgam	40,692	5,782
2. Anantnag	274,473	33,686
3. Kulgam	202,957	24,546
4. Shopyan	93,318	12,395
5. Pulwama	155,426	19,689
6. Tral	60,414	7,919
Total	832,280	104,017

The district is rich in agriculture. The Kulgam *tahsil* is the rice-bowl of the valley with irrigation facilities provided by the tributaries of the river Jhelum. Horticulture has made advances in this district where apples, pears and plums are grown. The road to Pahalgam—the well known health resort and the sacred cave af Swami Amarnath passes through this town. The Martand temple built on a *karewa* with an open plain is a remarkable piece of architecture with a range of snowy mountains at its back. The Lidar valley is picturesque with its glaciers at higher altitude where birch and juniper bushes predominate. The bold peak Gwashi Bror (Kolohoi 4,270 m) rises above the surrounding mighty peaks of the valley seen even from Gulmarg. These mountain peaks are an emblem of purity, dignity and repose.

There are many holy springs in this area, some known for medicinal qualities. Trout fish is found in Achhabal and many streams have this culture.

The National Highway to Srinagar passes through this district and the river Jhelum has its source in an octagonal spring at the foot of a spur across the Jawahar Tunnel to its north.

During the Fifth Five Year Plan many spill over schemes have been proposed for this district where improvement has started in low grade areas. Rural roads have been opened connecting important villages. *Gabbas* are made in this area and sold to the tourists. *Kangri* making and wooden toys and mostly weaving are some of the industries developed with financial and technical aid given by the Government.

SRINAGAR

The district of Srinagar is in the centre of the Kashmir valley and its area is 3,013 sq. km. (2,909.7 sq. km. rural and 103.3 sq. km. urban). The population of the district is 827,697 (males 447,508 and females 380,189). The growth rate from 1961 to 1971 is +27.54 with a sex ratio of 850 females to 1,000. There are 97,570 residential houses in the district and the density per square kilometre is 275. There are 5 *tahsils* in this district—(1) Ganderbal, (2) Srinagar, (3) Chadura, (4) Badgam, (5) Beerwah. The distribution of population, *tahsil*-wise, is given below:

Tahsil	*Population*	*Number of residential houses*	*Number of villages*
1. Ganderbal	94,785	12,927	137
2. Srinagar	463,879	48,208	62
3. Chadura	98,042	12,842	140
4. Badgam	929,795	10,737	184
5. Beerwah	78,196		200

There are 756,248 Muslims, 60,081 Hindus, 10,537 Sikhs, 460 Buddhists and 356 Christians in this district. There are only two towns.

The premier capital city Srinagar (1,588 m) is in the centre of this district. The urban area of Srinagar as it existed in 1961 was reduced during inter census period of 1961-'71, when Natipora-Hyderpora lost its urban status. On the other hand the two *tahsils* of Beerwah and Chadura raised the number to five.

The demographic position as it stood in 1971 is as under:

Town	*Persons*
1. Srinagar Municipality	423,253
2. Badamibagh Cantonment	7,982
3. Outgrowths: Natipora (6,400), Kursupadshahi Bagh (1,293), Bemina (2,020), Bagat Barzala (2,145).	11,858

The river Jhelum is the main waterway with its affluents forming a flat alluvial bed renewed in its lower contours by floods. The Flood Spill Channel was opened in 1903 after the devastating flood of the year 1893 when the valley became virtually a lake.

During the Fifth Five Year Plan out of Rs. 800 lakhs more than 410 lakhs have been utilized for spill over works. The district of Srinagar has all the natural advantages for economic and social development. As a tourist centre the city is bound to develop if sanitation improves along with facilities to tourists. Recreational and cultural facilities in the two cities will undoubtedly attract people from all over the world. High quality wool, handicrafts of international repute, shawls, *namdas*, carpets, wood carving, paper maché are in demand.

The recent development in means of communication and transport have added to the charm of the city of lakes and attractive waterways. Srinagar is connected by air to Jammu, Delhi, Amritsar, Chandigarh and Leh.

Srinagar district is developing fast as a result of its location, communication and marketing. Out of the total workers numbering 118,396 more than 84 percent are engaged in non-agricultural pursuits. Trade and commerce engaged 12.50 percent of total workers and transport and communications 12.48 percent.

The Kashmiri people are "considered to be the purest specimen of the ancient Aryan settlers in the valley." The site of Srinagar, though not so meticulous, is yet the best that could be availed of in the region with embankments on the bank of the Dal lake. It provides scenic grandeur and a repository of water. The two natural sentinels are the hills, Sankaracharya and Hari Parbat. These are defence points guarding the city through which the river Jhelum flows with eight bridges spanning over it. The city has a long history from very early times. Opening of roads and use of electricity are the two main factors responsible for development in this area which played a significant role in the recent history of our country.

BARAMULLA

The Baramulla district lies to the north of the Kashmir valley. It has an area of 7,958.00 sq. km. The district has 9 *tahsils*. The total *popultiona* is 775,724 (males 419,862, females 355,862). The growth rate from 1961 to 1971 is +20.33 with a sex ratio of 898 females to 1,000. There are 97,215 occupied residential houses and a density of 104 per square km. The distribution of population in 1971 is given below:

Tahsil	*Population*	*No. of occupied residential houses*
1. Bandipore	71,593	9283
2. Sonawari	92,244	12,753
3. Sopore	127,823	14,231
4. Baramulla	134,007	16,129
5. Gulmarg	37,222	5,271
6. Uri	50,211	6,329
7. Handwara	96,009	12,159
8. Karnah	22,006	3,147
9. Kupwara	139,749	17,913
Total	775,724	97,215

There are 1,020 inhabited villages in this district and 6 towns. The number of Muslims is 744,058, Hindus 21,237, Sikhs 9,803, Buddhists 342, Christians 270 and Jains 2.

There are six towns in the district: These are (i) Bandipore (6,201), (ii)Sopore, (27,627), (iii) Baramulla (26,334), (iv) Gulmarg (543), (v) Handwara (5,025), and (vi) Uri (443).

Paddy is the main crop but in recent years lift irrigation has extended the culvivable area near Baramulla towards Chakla and Niadihal. In Sopore *tahsil* horticulture has spread towards the elevations to the north. In Handwara *tahsil* apples are grown for export.

Not only in the quantity of fruit grown, but also in the superiority of quality and the number of varieties of different fruits grown, the district of Baramulla is well known. Apples, pears and peaches, cherry, plums and apricots are grown for export. Of the dry fruits walnut is important. The quantity of oil seeds grown is not much. Agricultural waste consists of paddy straw, rice husk and rice bran. The utilization of these materials for industrial purposes has also begun. Rice bran containing 10.20 percent oll is extracted after due processes. It is brown in colour and contains chlorophyll.

To the west of Baramulla is the Gulmarg *tahsil*. To the north-east of the Panjal range of mountains under the shadow of Mount Apharwat (4,420 m) lies this beautiful alpine valley. There is a variety of flowers and plants like *Euphorbia Thomsoniana* yielding a milky juice used as medicine by the people. The Nanga Parbat (8,115 m), the fourth highest peak in the world, is visible from here.

The district of Baramulla has a number of industries like the match, the resin and turpentine, sports, sentonine and rifle half-wrought.

The largest fresh water lake in Asia is the Wular situated near Sopore and Bandipore, the two *tahsil* headquarters wherefrom fresh fish is sent to Srinagar. As a rich protein food fish is prized and its culture is spreading with the introduction of a variety called carp. A new programme for the development of pisciculture has been taken up during the Fifth Five Year Plan when food fisheries, sport fisheries and development of river and lake fisheries has been taken up.

LADAKH

The district of Ladakh has a total area of 95,876 sq. km. It includes 37,555 sq. km. under the illegal occupation of China. Ths area on the Indian side of the Line of Actual Control is 58,321 sq. km. This district underwent some jurisdictional changes in recent years when for better administration a new *tahsil* known as Zanskar was carved out making the number of *tahsils* 3 in this district. There are 238 villages in this district and a population of 105,291 (1971). In view of peculiar social customs like polyandry it is necessary to write that the number of males is 53,315 and that of females is 51,976. The average density of population in the district is 2. The following table gives the distribution of population tahsil-wise in 1971 :

Tahsil	*Total population*	*Males*	*Females*	*No. of residential houses*
1. Leh	51,891	25,919	25,972	11,884
2. Kargil	46,514	24,004	22,510	7,778
3. Zanskar	6,886	3,392	3,494	1,591
Total	105,291	56,315	51,976	21,253

The growth rate during 1961-1971 has been +18.77 percent, with sex ratio of 975 females to 1000 males. The population in this district on the basis of religion is as under :

Religion		*No. of people*
Buddhists	..	54,565
Muslims	..	49,131
Hindus	..	1,152
Sikhs	..	361
Christians	..	81

There are two towns Leh (5,519) and Kargil (2,390). Leh 3.525 m is the district headquarters and the tahsil headquarters with a population of 5,519 (males 2,865 and females 2,653) in 1971. The density of population at Leh is 603 persons per sq. km.

Leh is the nerve centre of this district through which flows the river Indus over a distance of about 966 kms. It contains the loftiest inhabited tracts of the world as no part is below 2,733 m and a large portion of the population lies between an elevation of 3,657 m to 4,572 m above sea-level. The level ground is irrigated and the villages present an oastic beauty within the barren massiveness of the mountains. A land of peculiar charm Ladakh is utterly destitude of the verdant beauty of Kashmir. The lofty sandy plains and rugged granite ridges have a beauty of their own.

The *Kargil tahsil* is a tract 914 m above sea-level. It is an extensive place of alluvium easily irrigated by the river Suru. Scattered villages are situated on its banks. The tract is picturesque with beautiful parks and an amphitheatre of mountains. An extensive sandy plateau is being brought under irrigation towards *Manlba*. Sandstones of brillient colour and sharply cut in outline make this area beautiful.

The *Zanskar tahsil* lies to the southwest of Ladkh. It is a wild glacial tract with narrow elongated habitation in the ravines of the river Zanskar. The climate is very rigorous and snow falls with fierce winds. With only a short period for crops to grow Zanskar remains cut off from the rest of the country during most of the year. The passes of Lahul, Padar and Suru are negotiated on ponies from July to October.

The line of Actual Control was adopted on 11 December 1972 when the Indian army and the Pakistan army moved around on the Cease Fire Line making slight adjustments. In the Mini marg sector of the Indian Union this Line reaches Karobalgali and then passes through Neeral in the Indian Union and Breliman in Pakistan. Then towards Chet in the north in Kargil sector and to Chorbala in Tartok Sector till Thang under the Indian Union is reached. Beyond Thang lie vast tracts of glaciers.

Like the rest of India Ladakh is developing under the Five Year Plans; steps have been taken to exploit resources. There being hardly 0.75 percent area under forests an intensive programme of plantation began with new species like poplar, willow or hypopia. These species have been grown with success.

New roads have been built in addition to the 246 km long one connecting Kargil with Leh. It has opened a chapter in this trans-Himalayan region. Buses and trucks ply on the road adding to the development of economy and social life. The 39 km long road from Leh to Hemis is jeepable. Many new link roads have been opened like the one from Leh to Chushul. There are post and telegraph facilities now and Srinagar is linked with Leh by wireless telephone. Leh, Kargil and Dras have telegraph offices. Nubra, Chushul, Zanskar and Dras are developing into settlement centres.

The expenditure during the Fifth Five Year plan is Rs. 1,800 lakhs in which infrastructure received priority so also, the Kargil to Zanskar road. The other development plans have include cultivation of a new variety of barley. Handicraft and cottage industries devloped with practical training to the inhabitants.

The district is under a Deputy Commissioner who is also the Development Commissioner in charge of administration and planning.

DODA

Doda is the second largest district of the State of Jammu and Kashmir. It is bounded in the north and east by Ladakh and by Himachal Pradesh in the south. It has an area of 11,691 sq. km. Wholly rural (11,655.9 sq. km.) and only 35.1 sq. km. is urban. The population is 342,220 (1971) and the growth rate in 1961-1971 has been +30.38 with 886 females per 1000. The number of villages in the district is 654 and the density per square mile is 29. This district suffered change in area by the inclusion of 10 of its villages transferred from Ramban *tahsil* to the newly created *tahsil* of Gool Goolabgarh in the district of Udhampur. The following table shows the distribution of population in the district with its administrative units in 1971:

Tahsil	*Population*	*Number of occupied residential houses*
1. Kishtwar	97,843	15,067
2. Bhadarwah	81,435	12,821
3. Doda	39,486	11,698
4. Ramban	88,783	13,869

There are six towns in this district: (1) Kishtwar, (2) Doda, (3) Banihal,(4) Batote, (5) Ramban, (6) Bhadarwah. There are 217,621 Muslims, 121,944 Hindus, 1,487 Sikhs, 1,036 Budhists, 116 Christians and 13 Jains in this district.

The river Chandrabagha (Chenab) flows through the magnificient gorges in this mountainous region clothed with a rich vegetation of deodar trees. Doda is centrally located in the east as the Headquarters of the district administration. The surrounding mountains with many passes and Alpine glades provide grazing lands for the *gujjars* and *bakerwals* who sell hides, milk products and raw wool in the market. Sheep breeding is an important industry.

Bhadarwah (1,650 m) is known as *Chhota* Kashmir surrounded by thick forests of pine kail, or deodar trees. Apples, pears, apricots, and walnuts grow in this region. Besides, knol khol, beans and *guchhian* (mushrooms) are widely grown. Kishtwar is a hilly area richly forested with climatic similarity to Kashmir. The Chinar tree and saffron of inferior quality grow here with apples, cherries, apricots and plums.

To the north of Kishtwar is Padar at a high elevation where precious and semi-precious minerals, like saphire, acquamarine and beryl are found. This region is connected by road with the Jammu-Srinagar Road at Batote.

UDHAMPUR

The district of Udhampur is an elongated area extending from the Jammu Siwaliks in the south to the Middle Himalayas in the north. Across the mountains to the north is the *tahsil* Kulgam in Kashmir valley. The District Doda is to its east and the district Punch to its west a typical dun town. The area of the Udhampur district is 4,594 sq. km, and it had a population of 338,846 (males 177,596, females 161,250) in 1971. The density of population in this district is 74 and the growth rate from 1961 to 1971 is +32.28. The sex ratio is 908 females to 1,000 males. The following table shows the distribution of population in this district.

The number of occupied residential houses is 59,047. The number of villages in the district is 617. The number of Hindus is 222,664, Muslims 111,544, Sikhs 3,902, Christians 694, Buddhists 34, and Jains 4. There are four *tahsils* in this district: (1) Ramnagar, (2) Udhampur, (3) Reasi, (4) Gool Gulabgarh.

Distribution of Population in Udhampur-1971

Tahsil	*Population*	*No. of occupied residential houses*
1. Ramnagar	90,715	15,048
2. Udhampur	121,485	22,498
3. Reasi	53,275	9,387
4. Gool Gulabgarh	73,371	12,114

There are five towns in this district: (1) Ramnagar, (2) Udhampur, (3) Chenani, (4) Katra, (5) Reasi. The distribution of population is low towards higher elevation where grazing ground are used by *gujjars* and *bakerwals*. These graziers produce sheep, goats, milk products, raw wool and hides, which they give to *sahukars* who pay them in advance.

The physiography of this district is picturesque. The deep gorge of the river Chenab separates it in the east from Doba. The town of Udhampur is district headquarters with a population of 16,392 (1971) widening in extent to its south. It is directly connected by the Dhar Road to the Jammu-Pathankot Road at Dialchak. The opening of the railway from Madhopur to Udhampur will increase the economic and general importance of this town. As a terminus for tourists the importance of this town will increase.

The resource potential of the Udhampur District is sufficient for its growth. Surrounded by the Middle Himalayas rich in forest wealth and mineral resources there is scope for exploitation of agricultural raw materials and power. At a height of 704 m above sea level and at a distance of 67.5 km from Jammu and with Kathua on the bank of the river Ravi, the development is going on now towards the Dhar Road.

Kud (1736 m) is a health resort close to Patni top (2,060 m) now developed as a tourist resort. Milk products and clarified butter is collected and sold in the market.

Reasi (100 m) is the *tahsil* headquarter where a hydroelectric project is under completion at Salal. The capacity of the Chenani Hydel Project is 15 MW and of Kalakote Thermal Station 11.3 MWs. The exploitation of minerals like coal, copper and iron ore with the help of hydel power is necessary.

Katrah is a foothill township of importance wherefrom begins the pilgrimage to the famous shrine of Vaishno Devi where tea is also grown on hill sides.

KATHUA

The district of Kathua lies to the extreme south of the State. It joins the plain of the Panjab across the river Ravi. The western boundary of the district is the river Ravi and the area is 2,651 sq. km. The density of population per sq. km. is 104 and the number of residential occupied houses is 47,396. The population of the district is 274,671 (males 142, 989, females 131,682—1971) and the growth rate from 1961 to 1971 is +32.42. There are 921 females per 1000 males. The number of villages in this district is 586 and the number of towns 4. There are 4 *tahsils* in this district. These are : (1) Billawar, (2) Basoli, (3) Kathua, and (4) Hiranagar. The distribution of population is shown in the following table.

Kathua is a very important town in Jammu Province. Through Kathua passes the road and rail to the rest of the Indian Union. The entire traffic of persons and goods on land to and from has to pass

Tahsii	*Population*	*No. of occupied residential houses*
1. Billawar	58,071	10,104
2. Basoli	48,699	9,438
3. Kathua	84,254	14,143
4. Hiranagar	83,647	13,713

through this area which assumed considerable importance since independence in the year 1947. An industrial estate has come up in Kathua where guns, sanitary wares, electric insulators, staples, blended yarn, cables, stainless steel utensils and cement pipes etc. are manufactured for export. During the Fifth Five Year Plan many link roads have opened the interior of the district towards Koota, Ratanpur, Billawar, Dhanao, Mahanpur, and Ghati. The rural roads connect the countryside and establish road links with Dial Chak, Ding Amb, Satoora, Katli, Sanyal, Digota to Kumani. The number of towns is four.

Basoli (33,091), Lakhanpur (616), Kathua (17,416) and Hiranagar (83,647) are the four urban centres in this district. It may, however, be pointed out that this district has a rich potential of agricultural resources with facilities of irrigation by the Kathua Feeder and a developing network of roads.

JAMMU

The district of Jammu lies of the south of the State extending over the undulating high plain of the Siwaliks. To its east is the district of Kathua and to its north is Udhampur. The area of this district is 3165 sq. km. with a density of 231 persons per sq. km. There are 124,340 residential houses in this district. The population is 731,743 (381,138 males and 350,605 females.) The growth rate. from 1961 to 1971 has been +40.52. There are 920 females per 1,000 males. There are 1,121 villages in this district and the number of towns is seven. The following table shows the distribution of population:

Tahsils	*Population*	*Males*	*Females*
1. Samba	114,667	58,975	55,692
2. Ranbirsinghpora	156,395	80,212	76,183
3. Jammu	338,219	381,138	350,605
4. Akhnoor	122,462	62,519	59,493

The district of Jammu is important for its location. Being the gateway of Kashmir its central position in the Outer Plain and the Outer Hill regions adds to its commercial and strategic importance. As a nodal point of a network of road and the railway terminus Jammu directs the entire passenger and goods traffic to the territories of the State. The aerodrome at Jammu connects Srinagar at a time distance of 45 minutes.

In recent years development has taken place at a rapid pace. Scarcity of water resources, lack of knowledge about dry farming are being attended to and have been given priority to remove backwardness. During the Fifth Five Year Plan rural water supply schemes received priority.

The urban growth continues in Jammu district: (1) Samba (5,890), Bishna (3,570), Arnia (5,846), Jammu (MC, 155,338), Jammu Cantt. (6,299) and Akhnoor (5,533),. The distance from Jammu to Samba in the south is 40 km on the Pathankot-Jammu Road and 34 km from Jammu to Akhnoor in the West. Within this distance of about 75 kms the district of Jammu has considerably developed during recent years.

The Jammu urban area is about 178.86 sq. km. with a total population of 211,534 (males 113,677 and females 97,857) and a sex ratio of 816 per 1,000. The density of population is 1,183 persons per sq. km. compared to 3,076 of Jammu municipality. Trade, commerce and transport sectors claim a large number of workers coming from the components of the urban area. A number of rural areas with agricultural lands and open spaces have extended the Jammu outgrowth at Nagrota, Satwari, Narwal Bala, Sarnal with 35 rural components. The rail head complex of Jammu city has potential for development within an area of 3,000 acres declared as notified area to avoid congestion by unplanned construction. Housing colonies will come up on demarcated sites with modern facilities.

RAJAURI

The district of Rajauri is a new one as it was carved out by detaching the *tahsil* of Rajauri and Nowshehra from Punch district. This district has an area of 2,681 sq. km. with a population of 217,337 (males 114,380, females 102,993) and a sex ratio of 900 females to a thousand. The growth rate from 1961-1971 is +26.73. The average density of population is 81. There are 132,551 Muslims, 81,357 Hindus, 4,144 Sikhs, 283 Christians and 36 Buddhists. The distribution of population in 1971 is shown below:

Tahsil	*Population*	*Males*	*Females*	*Number of residential houses*
Budhal	27,989	15,012	12,977	4,462
Rajauri	116,491	61,491	55,000	18,437
Nowshehra	72,893	37,877	35,016	13,158

There are 396 villages in this district and 2 towns—(i) Rajauri (5,939) and (ii) Nowshehra (2,458).

The district lies between the district Punch and the district Jammu. The *gujjars* and *bakerwals* who were nomads are settling now with socio-economic facilities provided during the successive plans. Wooden articles like spoons, combs, sticks are prepared for sale. Besides milk products and hides are sold to the merchants in advance. Plums and apricots are widely grown. Nowshehra is the second *tahsil* headquarter on the Jammu-Punch road.

The Fifth Five Year Plan has drawn up a phased programme of economic and social development in this district which is backward and in need of economic uplift. Cease Fire Line, now the Line of Actual Control, passes through this district coming close to the army on the other side of the quiet border. It gives military importance to this area.

PUNCH

The district of Punch has a total area of 1,658 sq. km. according to the Census 1971. It has two *tahsils* (i) Haveli, (ii) Mendhar. As many as 391 villages (of *thasil* Rajauri 260 and *tahsil* Nowshehra 131) were detached to form the newly constituted district of Rajauri. The two towns Rajauri and Nowshehra were also detached and included in the newly created district of Rajauri.

The two towns are Punch (11,981) and Surankote (1,822). The total population of this district is 170,787 (males 89,750 and females 81,037). The growth rate from 1961-1971 is +10.52 and sex ratio of females is 903 to 1000. The density of population is 103 per sq. km. The distribution of population is shown as under:

Tahsil	*Population*	*Number of residential houses*
Haveli	74,699	12,112
Mendhar	96,088	14,289

The area is mostly rocky and undulating. There are small valleys with patches of agricultural land used for cultivation. On higher elevations graziers move with their sheep aud collect hides and milk products which are sold in the market. Maize is mostly grown followed by paddy. The district forms the sensitive frontier which is properly defended. The two districts of Rajauri and Punch have 0.87 lakh of *gujjars* and *bakerwals*. Traditionally connected with cattle and sheep these gaziers are inclined to develop animal husbandry. During the Fifth Five Year plan the development programme included sheep breeding. Artificial breeding stations and key village blocks with sub-centres have been set up for artificial insemination to improve livestock breed.

In recent years the roads have been widened and irrigation facilities provided besides social and cultural amenities.

PROSPECTS

The State of Jammu and Kashmir not only excites aesthetic interest but also stimulates intellectual motivation. The history of this land with its diverse relief and harmonious cultural tapestry bears testimony to the fact that in creative thinking the contribution of Kashmir has been remarkable. Even though isolated for its rigid geography in the past the inhabitants of this mountain region utilized their leisure in splendid isolation enriching philosophy, art, craft and architecture. In a large measure it was the aesthetically stimulating scenic enironment of Kashmir that brought about the efflorescence of artistic talent among the people of the valley. Development of creative art was largely due to the fusion of various streams of culture—the Aryan, Greek, Iranian, Turkish, Hun, Tibeto-Mongoloid and Roman.

The handicrafts of Kashmir with a world wide reputation presented the lovely face of the vale of Kashmir in its harmonious symphony of nature in its flora and fauna. Attractiveness for this land loomed large from climate to vegetation, springs to lakes, glades to glaciers and sunflower to saffron flowers. Its natural landscape offers a variety of scenic spots which are a significant source of attraction for tourists from all over the world.

The location of Kashmir at a strategic position in the continent of Asia influences its economic, political and cultural life. The history of this land is of note after Independence. The land route to the State of Jammu and Kashmir runs through its southern province across the river Ravi both by road and rail to the foothill town of Jammu, which is the winter capital of the State. It is one of the busiest national highways. Traffic is brisk with passengers, tourists and goods.

In the summer the valley of Kashmir provides repose from the dust and din of busy life in the sheltering mountains, the winding rivers, the unruffled lakes and the floating gardens, and above all, the air with its balmy freshness and purity.

Many social groups spread over the territories of this State are now steadily stepping out of backwardness and raising the standard of life.

Economic growth is but a continuous process of adjustment and development. It is bound to result in adaptation of people to the everchanging physical and socio-economic environment. Forces of modernization are gradually spreading over this integral part of the Indian Union which has a deep rooted history of tradition and culture.

Recent historical events have shown that forces of secularism withstood the test of time in this part of the country where cultural synthesis from various streams of different religions and philosophy evolved a composite culture which may be termed cosmic. For the Indian Union, in particular Kashmir, is a symbol of the Indian faith in the coexistence of multiple cultural heritage. It is, therefore, in the fitness of things that a geographical study of this border State should receive careful study.

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